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Department of
Agricultural Economics
and Rural Sociology

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Ann Fisher
Robert King
William Hewitt
Donald J. Epp
Kelly Finley
J. Lynne Brown
Audrey N. Maretzki

PENNSTATE
College of Agricultural Sciences
1855

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Ann Fisher*
Robert King**
William Hewitt**
Donald J. Epp*
Kelly Finley***
J. Lynne Brown****
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* Department of Agricultural Economics and Rural Sociology (AE & RS)
** Graduate assistant, AE & RS
*** Undergraduate assistant, AE & RS
**** Department of Food Science

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**EXECUTIVE SUMMARY**

The primary objective has been to develop and evaluate alternative pilot materials for helping consumers appreciate how food risks are assessed and how that information is used in food safety policy decisions. The underlying hypothesis is that convergence of judgments about the seriousness of food risks requires two components. One, citizens must understand how risk assessments are conducted, and what questions these scientific studies can answer--and what questions they cannot answer. Two, both decision makers and their clientele must recognize that scientific estimates of the size of the risk are only one input for risk management policy decisions. Other aspects of risk also affect how people feel about food safety (as well as other risks), and these aspects often are (or should be) considered in policy decisions.

The pilot materials incorporate information to help people understand the risk assessment process and how other risk characteristics are legitimate parts of the policy decision. The materials present information about risks associated with food production, processing, and preparation practices. The materials include information about potential policies to alter the risks and about consumer choices such as alternative preparation practices or food types.

Rather than the dispassionate, technical, objective approach that government agencies traditionally have used, the materials appeal to the individual's sense of responsibility and concern about his or her own health.

Two sets of pilot risk education materials were developed. One set is printed. The other set incorporates the same concepts, but in a computer format where the "reader" interacts with the computer software.

Preliminary versions of the materials were developed on the basis of responses from participants in focus groups. The materials were pretested, refined, and then evaluated in pilot tests with groups expected to be typical of Cooperative Extension agents' potential clients.

The pilot tests provided data for evaluating the effectiveness of each set of materials, with respect to a) transmitting information about how food risks are assessed and how food risk management decisions are made, b) forming attitudes about food risks, and c) understanding policy options for managing food risks. The project report describes the procedures followed in developing, pretesting, refining, and pilot testing the materials. The report also describes the pros and cons of each format based on analysis of the evaluation data. It includes recommendations for further refinements and for targeting the materials to different audiences, as well as for distribution of the materials in their present formats.

The results of our study indicate that both paper and computer versions of the materials promote learning about the specific food risk. Many participants indicated that the material was easy to understand. Some wanted even more information about the specific food risk, but pertaining to risk management rather than risk calculations.

We found that information based on scientific consensus increased confidence in the participants' decisions about food choices and preparation. Objective, complete yet concise information apparently helped them alleviate dissonance associated with a specific food risk. The risk assessment and management information helped participants make better informed decisions about food risks and they felt better about control over their own risk exposure.

Informal discussions indicated that most participants think government (federal, state and local) is responsible for the safety of our food supply. The information presented to our participants about government and industry action significantly increased their confidence in both. Most participants were not aware of the actions and mechanisms surrounding food production and processing. The materials helped many participants feel more informed about their risk of foodborne illness.

We pretested materials about a specific foodborne illness (Salmonella enteritidis) with several groups. To measure a potential prompting effect, we gave some groups an initial brief questionnaire about the food topic. Their answers were then compared with those given by all respondents at the end of the exercise. We anticipated that giving preliminary questions would lead participants to search out information pertaining to these questions. We found very little evidence supporting a prompting effect. Perhaps participants' background knowledge about the food risk was enough to diminish any prompting effect.

We also hypothesized that the interactive features and novelty of the computer version might make it more effective. However, there appears to be no difference in effectiveness. Most participants preferred the paper version, even those who pretested the computer version. The paper version offered a more convenient and easier reference. Most participants wanted this reference to be at their finger tips.

The computer version entailed a longer start-up process (boot up, search, shut off) than the paper version. Many participants indicated informally that they thought the computerized version was quite good but would be most useful in an elementary or secondary educational curriculum. Several participants suggested the information be targeted to young teenagers as part of a course curriculum. Some suggested that it would be appropriate in 4-H programs supporting the USDA/Cooperative Extension Service Youth-at-Risk theme.

## INTRODUCTION AND BACKGROUND

Consumers' confidence in the safety of the food supply has been shaken by incidents of actual illnesses (e.g., from Listeria in cheese, aldecarb in watermelons) and by reports of potential dangers (e.g., cyanide in grapes, daminozide -- trade name Alar -- in apples). This has had two important impacts. One is that many citizens now have a sense of anxiety about food safety policies. The other is that their food choices now seem more complicated. Consumers find it difficult to understand scientific information about risks from naturally occurring toxins, additives, contaminants, or microorganisms. This difficulty is more pronounced when there are conflicting statements about how much risk is associated with a specific food, and still more pronounced when the food provides important nutritional or taste benefits that must be balanced against risks. The result often is sharp divergence in risk judgments by lay people compared with food safety experts.

News media often cover pesticide residues such as Alar on apples, or additives such as bovine somatotropin (BST) used to increase cows' production of milk.[1] For example, "60 Minutes" recently had a segment on monosodium glutamate (MSG). Unlike the Alar incident, the MSG coverage led to relatively little consumer concern. A food irradiation plant in Florida now is processing fresh fruits--despite highly publicized opposition before it began operating in early 1992. Somewhat less media coverage has been given to microorganisms such as Salmonella in poultry, even though far more cases of disease can be traced to microorganisms.[2] Consumer concerns mirror this media coverage.

The food industry and government agencies generally have reacted by arguing that food is safer than ever, and that the public should accept scientists' statements that minute residues of pesticides and additives are not harmful. This strategy has not been successful, even though the risk assessment estimates generally support its

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[1]Research has verified the impression that consumers are concerned about what is reported in the media. Zellner and Degner (1991) found that 59 percent of survey respondents were highly concerned about pesticides and chemical residues; 36 percent were highly concerned about additives and preservatives. Bord (in press) reported that 80 percent of respondents considered residues such as pesticides and herbicides to be a serious health hazard. Even artificial coloring was thought to be a serious hazard by 21 percent of respondents. At the same time, the Food and Drug Administration (FDA) has approved BST for experimental use, on the basis that BST treatments to cows, in reasonable doses, do not affect the quality of milk and are not a public health threat (Preston, McGuirk and Jones, 1991). Final approval of BST is expected in 1992.

[2] 400-500 foodborne disease outbreaks are reported each year to the Center for Disease Control (CDC) with an average of 50 cases per outbreak (Roberts and Foegeding, 1991). However, the causing organisms can be identified for only 40 percent of the outbreaks. Around 44,000 salmonellosis cases are reported annually to CDC, with 39 cases estimated to be missed for each case reported. Concern about Salmonella enteritidis led the state of New Jersey to mandate that restaurants could not serve soft-cooked eggs, much to the dismay of many customers.

validity.[3] In fact, government agencies frequently are accused of being co-opted by industry, and imposing risks on the public for the sake of profits for farmers and food processors.

Agency spokespeople, food producers, processors, and retailers have begun to realize that there is no silver bullet that will make consumers accept their point of view. The risk communication literature shows clearly that consumers' concerns about specific risks must be recognized and addressed if there is to be a realistic expectation that consumers will modify their initial judgments about the seriousness of these risks.

The question is how to design a strategy for helping consumers put various food risks in perspective, so that they can understand food safety policy issues and provide informed input into the policy process, make informed decisions about what foods to purchase, how to prepare food safely, and how much they should worry about risks associated with their food. This project focuses on concerns about naturally occurring food risks, as a first step. What we learn regarding how to communicate effectively about naturally occurring food risks can serve later as a basis for communicating effectively about food risks that result from human activities.

We developed and evaluated a pilot program for helping consumers understand how food risks are assessed--what science can tell us about food risks as well as what it cannot tell us--and how the resulting risk estimates can be used in risk management decisions. The goal is to help people understand the relative risks from food in the context of broader nutrition, health, and environmental concerns.

Government agencies and industry usually base safety judgments on risk assessments, which have three components (Fisher, 1982). The first examines whether the substance (e.g., contaminant, additive, residue) has the potential to cause any of several illnesses or reactions. The second determines whether it will be present in quantities large enough to result in symptoms. The third estimates how many people will be exposed to those quantities. These risk assessments yield two types of risk estimates: the risk to the maximally exposed individual (MEI risk) and the number of people who could be above a given risk level (population risk). When risk assessments show low MEI risk and low population risk, scientists judge the food to be safe.[4]

Studies by cognitive psychologists, economists and others indicate that it is difficult to communicate risks effectively, especially long-term risks such as those

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[3]See footnote 2. Data on chronic disease from food are very sparse.

[4]The seriousness judgment is more complex when one but not the other of these risk estimates is large. For a discussion of these issues, see (e.g.,) Keller and Sarin (1988) or Rayner and Cantor (1987).

associated with some pesticides and food additives (Adler and Pittle, 1984; Tversky and Kahneman, 1974; Slovic, 1987, Krimsky and Plough, 1988; and Bord, Epp and O'Connor, 1989). Most citizens find it difficult to understand small risks. People tend either to ignore risks entirely (e.g., some smokers) or to worry a great deal even when scientists' estimates show low MEI and low population risk (Fisher, McClelland and Schulze, 1989). The result is strong societal concern about some risks that scientists view as posing little danger and neglect of other risks that experts judge as very large (Allen, 1987; Science, 1990; Stevens, 1991). This suggests that scientists are often correct in feeling that consumers do not understand the size of the risk.

It also suggests that scientists do not understand what about risk really matters to people. Consumer judgments about the seriousness of a particular risk include characteristics (called risk qualities by the National Research Council in its 1989 book, Improving Risk Communication) that go beyond the two scientific measures of the magnitude of the risk. These characteristics include, but are not limited to the following:

- whether the risk is imposed on citizens rather than being voluntary (such as sulfites on lettuce at a salad bar, Alar in baby food jars of apple juice, nitrosamine in bacon),

- whether the risk occurs naturally (such as aflatoxin in peanuts and grain, or Listeria in cheese) compared with being manmade (such as most pesticides and food additives),

- whether it has the potential to affect many people in one area at one time (often called catastrophic; such as the California incident with aldecarb in watermelons), and

- whether the risk involves a dreaded disease (cancer).

If consumers view the risk as being involuntary, manmade, having the potential to be catastrophic, or involving a dreaded disease, they may judge it as serious enough to warrant action even if they agree with the scientists that the magnitude of the risk is small. Consumers may view the scientists' emphasis on quantitative estimates over qualitative aspects of the risk as being reductionist.

This suggests two directions for designing a strategy to achieve convergence of views between food safety experts and citizens. One is to make sure scientists and consumers agree about the magnitude of the risk estimates. The second is to understand the problem as the consumer defines it. This means examining the other characteristics of the particular risk that are causing consumer concern, acknowledging the legitimacy of concerns about these characteristics, and attempting to mitigate any that can be ameliorated. Sometimes actions as simple as having experts explicitly acknowledge a specific risk characteristic will lower the intensity of citizen concerns about that characteristic. In other cases, specific characteristics can be moderated with little effort or cost. The interaction between helping consumers understand the science behind the risk estimates and acknowledging and ameliorating other characteristics of the risk has the potential to lead to convergence in judgments about the seriousness of a particular risk.

There are several policy reasons for seeking convergence between judgments by experts and by ordinary citizens. One is that if public pressure causes the banning or restriction of truly low-risk activities, costs could become higher for goods that previously used these as inputs. Second, some potential alternatives for achieving the same effect (e.g., a pesticide to reduce insect damage) actually could have higher risks. Third, there are real social costs associated with worry, and these costs could be reduced if the experts and others agree about which risks are most serious. Finally, such agreement makes it easier to allocate both public and private resources toward reducing the most serious risks, rather than scattering efforts on some big risks and some much smaller risks, yet not addressing many of the largest risks. For food safety, this agreement could lead to less concern about pesticide residues and more attention to microbial risk, for example. This example has the advantage that microbial risks often can be controlled by the consumer.

**OBJECTIVE**

The overall objective has been to develop and test pilot materials for communicating about the risks of toxins, contaminants, and microorganisms. The primary goal is to enable consumers to evaluate food risks in a way that is more consistent with scientists' estimates of the magnitudes of the risks. This can improve their understanding of how food safety policy options related to food production, processing and preparation can reduce those risks, and serve as a starting point for them to provide their own input into the policy decision process.

This work was funded by the Extension Service, U.S. Department of Agriculture under special project number 91-EFSQ-1-4004. The model materials are designed for use by Cooperative Extension staff with their clientele. The ultimate target audience is the general public.

**PROCEDURES**

In early project meetings, ambitious goals and research designs were discussed. Some were discarded as infeasible within the available budget and time frame. Others were judged to be impractical from the perspective of what Cooperative Extension Service (CES) specialists and agents could be expected to achieve during limited contact time with each client. Through this winnowing process, the scope was refined and narrowed to maximize the potential usefulness of results.

Several key decisions were made. One had to do with the definition of Cooperative Extension clientele. Cooperative Extension specialists and agents cover a wide range of interests and types of clients. Adult clients range from homemakers to farmers to farm suppliers to food processors to food handlers (e.g., cooks and food service managers) to home gardeners. Younger clients often are in 4-H programs, which can differ substantially between urban and rural youth. We decided to concentrate on the general adult population as one that the CES wanted to reach with information about how food risks are assessed and how that information is used in food safety policy decisions.

Recognizing the needs and proclivities of adult learners, a second decision was made to develop the themes in the context of examples using specific food risks. This would make the concepts more relevant to their everyday activities, compared with abstract descriptions of how food risks are assessed and how food safety policy is decided. Reactions to information about a single food risk could be atypical, so we planned to include several example food risks.

The proposal stated that we would evaluate a paper (i.e., pamphlet) version of the materials compared with a computer version. We expected to have data for relatively small numbers of respondents, which implied that we would have to limit the number of variations in experimental "treatments" (i.e., materials). It also meant that we should make an extra effort to eliminate or control for potentially confounding factors. We recognize that many food risks are significant from a public health perspective, as well as from the perspective of consumer concerns. However, controlling as many as possible of the variables that could influence people's reactions to the materials improves the usefulness of the evaluation results. Some factors are beyond the control of researchers. Other factors can be made the same across all experimental "treatments" or materials.

To maximize the likelihood that observed differences in effectiveness actually reflected the computer format versus the paper format, we set up criteria for selecting the example risks. The risk communication literature points out that people often react differently to man-made risks than to naturally occurring risks. Such differences could confound our results, so one criterion was that all of our example risks would occur naturally. The risk communication literature also indicates that people tend to judge delayed (or latent, chronic) risks as more serious than risks where the outcome is known right away. Two of the example risks were selected to have primarily acute impacts, with a third having a delayed impact. Severity of impact also can be important in risk management decisions, so two of the three risks were selected because they generally are viewed as life-threatening. These criteria are summarized in Table 1 for the selected food risks.

| Table 1. Criteria for Example Risks | | | |
|---|---|---|---|
| | Salmonella enteritidis | botulism | aflatoxin |
| natural | XX | XX | XX |
| acute effects | XX | XX | |
| life-threatening (generally) | | XX | XX |

Stage 1. Developing Preliminary Materials

Initial Drafts. The research team--including two graduate research assistants--began collecting scientific information about the risk assessments, incidence of illness, and actions taken by industry or government for the three example risks (Salmonella, botulism, and aflatoxin). Very preliminary drafts were developed for each risk, along with general questions about perceptions of food risks and follow-up questions to reinforce learning and allow evaluation of the materials.

Experts were identified and contacted for additional scientific information and for review of the draft materials to assure correct interpretation of the available scientific literature. The materials are based on the best scientific information available through April 1992.

The materials explain how food risks are determined and how this information is used in policy decisions to manage food risks. Two versions were developed. The printed version is similar to traditional government information pamphlets. The computer version has interactive features. These early versions utilized visuals such as charts and illustrations in order to catch the reader's attention.

Designing the Materials. We initially patterned our approach after that used in experimental economics and psychology (Grether and Plott, 1979; Vernon Smith, 1982; Harrison, 1990). Difficulties with programming the computer version began during selection and procurement of authoring software. The software we had received (courtesy of McClelland and Schulze at University of Colorado) for interactive computer lab experiments proved to be inappropriate for the types of information materials needed for this project. Therefore, we reviewed available commercial software. Some versions of authoring software were expensive and required sophisticated hardware that was not readily available and would have taken extensive time and expense to procure.

The major crux in software selection was in finding a package that had both graphic and data collection attributes. Packages like "ToolBook" and "Knowledge

Pro" can provide such features, but require substantial training for a novice personal computer user. We estimated that it would take approximately 400 hours for a computer programmer to develop an application package that would meet our needs for graphics and data collection. This programming cost was beyond the resources available for the project.

Authoring software also would require an operating system for each program that is written. If a "ToolBook"-based program were developed, Micro-soft's "Windows" would have to be running concurrently with the program. Licensing agreements would require a copy of "Windows" for each computer using the program. The portable computers used in the pilot test for this project and many of those available to Cooperative Extension are not connected to a network. So users would have to purchase "Windows" for each machine, or perhaps a multi-user license (expected to be expensive).

Another category of authoring software packages relies on MS-DOS as an operating system. However, DOS tends to be more cumbersome in the use and design of programs. Other programs developed by universities and institutions were deemed to be either too crude to use or to have insufficient documentation.

In Pennsylvania, most Cooperative Extension offices have Apple II or MacIntosh computers that require conversion software to use an IBM-based program. Such software is only available at the time of this writing for "ToolBook". We selected the IBM-compatible format, however, because the information available to us suggested that most states' Cooperative Extension offices are using IBM-compatible personal computers.

The ability to rely on unsophisticated computer hardware also was a determining factor. Our investigation revealed that only some Cooperative Extension agents have computers. Many of those computers are fairly old and have limited capability for features such as graphics and color. Thus the software package we adapted has only simple graphics. Using an IBM format, we adapted a computer software package called Ci2 that was purchased from Sawtooth Software Company. This software can track responses for each participant, which makes it easier to evaluate effectiveness. The computer version was loaded onto portable personal computers for use on-site with different groups and individuals.

The computer materials follow the format of the paper version. Initial drafts covered three foodborne illnesses. Information was entered on a text type file called a "frame." A frame is several paragraphs of text, linked together with other frames by means of logic statements. Logic statements organize and sequence frames per written instructions. The instructions for sequencing frames are part of the computer program, but do not appear to the person using the software.

The Ci2 software offers limited flexibility in randomizing and changing frame sequencing contingent on a participant's response. These responses are recorded in data files that can be cross-tabulated with a basic program provided by Ci2. The data also can be exported into other statistical packages for analysis, such as SAS. In our study, because of the limited sample size, we manually entered the data. This afforded us the opportunity to verify and clean the data in a one step process. The Ci2 program requires basic DOS knowledge and has adequate documentation. Disks with our custom programming can be distributed for use and data collection without additional payments to Sawtooth Software Company.

Focus Groups. Focus groups discussed very preliminary paper versions of the materials. Focus groups initially were used in marketing research, but have been adapted for other social science research needs (Desvousges and Smith, 1988). Because they are conducted with small samples, the results are qualitative rather than statistically representative. Initial participants were recruited from graduate and undergraduate students.

A focus group of eight graduate students in policy analysis and agricultural economics reviewed and responded to draft materials in October, 1991. We used their feedback as the basis for revising the draft materials. The revised materials were pretested by two focus groups with a total of 21 undergraduate students in agricultural economics in November, 1991. The students were at least sophomores, so had more background in science than the general public.

The sessions were (audio) taped so the research team could clarify their notes. Different moderators were used, but followed the same protocol. Copies of the protocol, and a summary of comments appear in Appendix A.

Focus groups gave numerous suggestions for improving our materials. Many participants wanted expanded versions of the materials. They wanted the expanded materials to include more information concerning signs and symptoms of foodborne illness, what to do to avoid illness and more information about the foods involved. They wanted the materials to provide all relevant information concerning a specific illness, yet be brief and easy to read.

Stage 2. Designing and Pretesting Materials about Three Food Risks

Results from the focus groups conducted in Stage 1 served as a foundation for designing full versions of the pilot information materials. The materials recognize that people are uncomfortable with uncertainty, and acknowledge that scientists' risk assessments cannot guarantee that there is zero risk associated with the use of a food production or processing practice. They give some background about risk assessment methods and how risk estimates can be incorporated in risk management decisions for naturally occurring toxins and microorganisms. The materials present information about risks associated with food production, processing, and preparation practices as well as potential policies to alter the risks (including individual "policies" such as consumer choices of alternative food types). They discuss factors that influence judgments about the relative seriousness of various food risks and their relation to health and environmental concerns.

The design of materials incorporates insights from work by van Ravenswaay and Hoehn (1990) related to perceptions of the risk from pesticides on produce. Other insights came from the U.S. Environmental Protection Agency's (EPA's) recent Hazardous Substances in Our Environment: A Citizen's Guide to Understanding Health Risks and Reducing Exposure, and from the food safety module pretested by UC-Berkeley under the Chemical Education for Public Understanding Program (CEPUP). Although the CEPUP module is designed for secondary school students, some of its concepts were adapted for the pilot materials. Selected messages in the pilot materials reflect actions on the part of the food industry and government agencies to address other risk characteristics that concern consumers. Thus, some of the convergence in risk judgments is shown to come from the experts.

A "self-assessment" feature was built into the materials for two reasons. One was to motivate the participant to read the written materials or work through the computer exercise. The other was because it provided an easy way to get the data for assessing their knowledge, attitudes, and understanding of policy options.

The original paper and computer version had three food risk examples; Salmonella, botulism, and aflatoxin. The materials were revised on the basis of review by experts knowledgeable about these food risks. Then they were pretested at the January 1992 New England Cooperative Extension Risk Assessment and Risk Communication workshops in Portsmouth, NH and Auburn, MA.

Participants were divided into four groups, with each group receiving one of the following treatments:

questions only (baseline)
paper version
computer version
paper and computer version

This design was intended to permit comparison of a baseline level of knowledge with performance under each of the remaining three treatments.

Ten portable computers were set up at the rear of the workshop room. The workshop schedule was quite full, so only 45 minutes were available for conducting our pretest, following a brief explanation of the study's objective and why we wanted their feedback. The participants were eager to pretest the computer (or computer with paper) version. The limited number of computers, the short amount of time available, and the length of time required for participants to read and respond to the materials meant that we could not have an even distribution across the four design treatments. Table 2 summarizes the cell sizes for the New England pretests (as well as the other pretests). It shows far fewer responses in the computer cell.

Table 2. Pretest and Pilot Test Groups

| Group | # of Participants | | Paper | Computer |
|---|---|---|---|---|
| | M | F | | |
| Focus Group 1 | 7 | 4 | 11 | -- |
| Focus Group 2 | 12 | -- | 12 | -- |
| New England | N.A. | N.A. | 34 | 14 |
| Rose | 8 | 26 | 21 | 13 |
| Lancaster | -- | 59 | 47 | 12 |
| Personal | 8 | 15 | -- | 23 |

Appendix B includes the paper version of the materials and questions used in the New England pretest. The computer version has the same information, except that it appears one screen at a time. The two charts for botulism were xeroxed for computer respondents because the software does not support graphics. The other drawings used with the earlier focus groups were eliminated from the paper version, to assure consistency with the computer version. Appendix C includes the informal follow-up questions used with respondents in a one-on-one basis when they completed their treatment, and a summary of their responses.

The Cooperative Extension specialists and agents were enthusiastic about the materials and responded favorably about both computer and printed versions. The time necessary to pretest the materials ranged from twenty to fifty minutes.

For those who finished in 20 minutes, it was not entirely clear that they answered all of the questions. Rather than working through the full materials they simply might have paged through the last two sections to see what was there. These Cooperative Extension specialists and agents are more motivated and better informed than the general public can be expected to be. Thus if it takes them more than twenty minutes, it would take target audiences even longer.

Some workshop participants wanted more information or to provide more feedback on the materials. The next week, we sent a copy of the paper version to each participant, asking for any additional input they wished to provide. Relatively few responded to this opportunity, but their feedback was combined with that obtained at the workshops.

Table 2 shows that there were more participants at the New England Cooperative Extension workshops than in the initial focus groups. These cell sizes are still too small for statistical analysis, but this qualitative information guided further revisions of the pilot materials.

Stage 3. Designing "Final" Pilot Materials

Based on the Stage 2 pretest results, the materials again were refined. Botulism and aflatoxin were dropped, because it took too long for the New England participants to work through the materials. We expect it would take target audiences even longer than it takes Cooperative Extension specialists and agents. In addition, some participants were overwhelmed by the amount of information being presented and tended to become confused about details.

After dropping the sections about botulism and aflatoxin, the Salmonella enteritidis section was expanded. Questions were designed in response to suggestions by professionals and paraprofessionals who work predominantly in this topic area; we thought they provided the best indicator of what and how much information was necessary to deliver an adequate message to our target audiences. Appendix D includes the materials used for the pilot distribution and evaluation. During Stages 2-3, arrangements were made for the pilot distribution and evaluation of the revised materials in Stage 4.

Stage 4. Evaluating Pilot Materials

Several target groups participated in the pilot distribution and evaluation. Most of them required using 10-11 computers for the computerized version of the materials, so that the evaluation data could be gathered within a reasonably short time period. Pretests and post-tests allowed measurement of changes for each participant, and differences in message treatment across groups allowed measurement of the relative effectiveness of each treatment.

The research design was modified for the pilot distribution and analysis. This change permits testing the hypothesis that the attempt to answer the factual questions prior to seeing the materials prompts respondents to learn more about those questions when they do work through the materials. Thus respondents were divided into four groups:

| | |
|---|---|
| Group 1: | paper version |
| Group 2: | computer version |
| Group 3: | comparison/paper (answer factual questions first, then read materials and answer all questions) |
| Group 4: | comparison/computer (answer factual questions first, then work through materials and questions) |

Groups 3 and 4 provide comparison baseline data so that we can evaluate whether the computer or paper versions (Groups 1 and 2) actually promote learning, and which one is more effective. Comparison of responses for Groups 3 and 4 after seeing the material with their baseline responses also can measure learning, but it could be inflated by their initial exposure to the factual questions. Thus, comparison of post-test responses for Groups 3 and 4 with responses from Groups 1 and 2 allows us to evaluate the prompting effect of seeing the questions before the materials. The results are presented in the evaluation section below.

## PILOT TEST GROUPS

### Cumberland Valley Chapter of the American Rose Society

The 34 Cumberland Valley Rose Society participants (referred to as Rose in the sections below) who attended that meeting are women, mainly aged fifty and up. Most at least completed high school and prepare the majority of meals for themselves or others. Most of them live in suburban neighborhoods in Franklin County, PA, which is predominantly rural. Overall, they tend toward conservative and traditional values. The materials were pretested during the first hour of their monthly meeting on April 21, 1992. We view this group as typical of many clients seen by Cooperative Extension home economists.

Lancaster Group

Following a March 1992 meeting with Dr. Mary Jo Deering (Office of Disease Prevention and Health Promotion, U.S. Public Health Service), we planned a major data collection effort for the pilot test. It was to be part of a poster session at a June 1992 conference sponsored by federal agencies for health communicators and congressional staff. However, the interest in the poster session turned out to be so strong that the conference organizers decided to post-pone that part for a conference not yet scheduled.

Fortunately, we were able to rebound from this uncontrollable loss of a data collection opportunity by collaborating with the Lancaster County Cooperative Extension Agent. She made an hour-long time block available at the May 15, 1992 meeting scheduled for EFNEP and WIC professionals and paraprofessionals from several counties. This group is referred to as Lancaster in the sections below.

The Lancaster group had 59 women, most of whom were at least 30 years old and had some college education. Almost all of them were involved in some type of nutrition counseling or advising. Most of these women prepared the majority of the meals for themselves or others. Thus we would expect them to be more knowledgeable than the general Cooperative Extension client, but to be good judges of how their clients might react to the computer or paper versions of the materials.

Personal Interviews

In response to our need for additional data and suggestions from potential users, we engaged in personal interviews with neighbors, colleagues and friends.

The interviews were held between the second week of May 1992 and the second week in June. Twenty-three participants were involved in this informal setup. Most of these respondents did not prepare the majority of the meals. These interviews utilized the computer version with no preliminary questionnaire.

Overall, our interviewers thought that the personal interview responses were even more constructive because participants were not pressured by either time or group dynamics. There appeared to be a distinct difference in responses due to the lack of group affiliation and personal interaction. These differences were not formally tested but informally observed. This group is called Personal in the sections below.

## EVALUATION

### Hypotheses

Our goal was to compare alternative communication modes by systematically varying the message format (written versus computerized version) and assessing the relative effectiveness in:

- transmitting information (how much and what did they learn about how food risks are assessed and how risk management decisions are made?),

- stimulating a reassessment of attitudes (are they more aware of food safety issues; is their level of concern higher or lower after exposure to the message; do they have stronger beliefs and attitudes regarding naturally occurring toxins, contaminants, and microorganisms?),

- developing an understanding of options for public or industry policy and for individual action (do they feel they can make a judgment about the desirability of a proposed food safety policy, such as county certification of food handlers, state and federal requirements about training for pesticide applicators, etc.; and (possibly) what behavioral changes do they plan to make?), and

- distinguishing between agreement about the size of various food risks and agreement about the seriousness of those risks (because other risk characteristics often are important to people).

From the outset, we recognized that not all components of this goal could be accomplished with materials that could be used by Cooperative Extension clients within a timeframe of about a half hour. We view the product (and accompanying analysis) as a first step toward accomplishing this goal.

Risk communication is still new enough that the literature does not provide firm guidance on how to design an effective program for helping people understand the scientific and policy bases for risk management decisions made to protect the safety of the food supply. We selected evaluation techniques to find out how well the pilot materials worked and what further improvements would be necessary before disseminating them widely.

Several hypotheses were tested:

H1 Respondents learn from either set of materials.

H2 Respondents learn more about food safety facts with the computer version than with the paper version.

H3 Respondents with the paper version are more likely to feel comfortable with their decisions about food choices and preparation practices (because they perceive it is easier to check back in the materials).

H4 Respondents using the sliding scale in the computer version are more likely to respond in the middle of the scale (compared with the discrete choices in the paper version).

H5 Respondents using the computer version are more likely to be more confident in their food choices or food preparation practices.

H6 Answering the questions before working through the materials prompts more learning.

The methods for testing these hypotheses are described below, followed by a discussion of results.

## Description of Statistical Procedures

Our first task was to determine if the three groups (Lancaster, Rose, and Personal) were significantly different from each other. We suspected that they would be, because of each group's objectives and membership characteristics. (The Personal group had no group affiliations that were measurable.) In order to account for any difference between groups due to the demographics and characteristics of membership, we conducted tests that separated by group. The data are aggregated in the discussion of responses only when there were no significant differences across the three groups.

We used a different test for each of the two types of questions in the survey. For the first type, respondents answered with a specific response and we used a Chi-Square test. For the second type, respondents decided a level of degree (e.g., "less confident" to "more confident" on a sliding scale), and we used an Analysis-of-Variance test.

The Chi-Square test is sometimes called a "goodness-of-fit" test because it determines whether the distribution of responses for a given question differs between groups. If the groups had the same distributions we could infer that the way a respondent answered the question was independent of the respondent's group, and therefore be justified in merging the groups for further analysis (Mendenhall 1978).

Ho: Question answers are independent of the group.

Ha: Question answers are not independent of the group.

The Chi-Square test statistics were very high for many questions, which meant that the distributions were different between the groups. Therefore, we rejected the null hypothesis Ho in favor of Ha and did not merge the groups.

The Analysis-of-Variance test compares the response means of each group for a given question to test whether the groups' question means are the same (Mendenhall 1978).

Ho: Question mean is independent of the group.

Ha: Question mean is not independent of the group.

Again, the test statistics were very high for a large number of questions. We had to conclude that the mean was not independent of the group, so we could not merge the groups.

After showing that the groups were significantly different from one another, we wanted to run multiple comparison tests to examine how the groups differed. We used Duncan's multiple range test. A Scheffe test might have been more appropriate. The Scheffe test is more conservative and is likely to accept rather than reject, compared with Duncan multiple range tests. However, the strength of our results indicates that using Scheffe tests would not yield different conclusions.

For all three tests, we used a significance level of .05 which means that there is a 5% chance we will reject the null hypothesis (Ho) when it really is true (Mansfield, 1987). This significance level is a widely used and accepted level.

## DISCUSSION OF RESULTS

Appendix D includes the pilot materials. This discussion refers to their questions by number.

### Initial Perspectives

General Awareness. All groups rated foodborne illness as a somewhat less serious problem than risks from car accidents, chemical production, home fires, or heart disease (Q 2).

Approximately 80% of the participants indicated that they had heard of a foodborne illness in the last three months (Q 5), although only half of the participants in the Personal group had heard of a recent outbreak. Most participants had heard about this through TV coverage of local news or local newspapers (Q 5). The Lancaster group differed slightly in that they also heard about outbreaks through work and magazines. This response would be expected because of their professional backgrounds and job responsibilities.

To establish a baseline, we asked participants to assess their own knowledge about foodborne illness (Q 6). The computer Lancaster and computer Rose group indicated less baseline knowledge about foodborne illness than other groups. Keep in mind the fact that these two subgroups each have a small number of observations. Even so, we looked at their backgrounds for an explanation and found they had a higher level of education then the other groups. A higher level of education may tend to make people more critical in assessing their own knowledge. That is, they could be more likely to know what they don't know.

When questioned about ever having foodborne illness (Q 9), all groups gave similar responses. Overall, 38% had experienced a foodborne illness compared to 44% who had not; 18% were not sure. However, when asked whether a member of the family or friend had experienced foodborne illness (Q 10), 50% answered yes and 21% were not sure.

<u>Knowledge About Risks from Various Foods and Stages of Production</u>. We asked respondents to assess the likelihood that each of four food categories (meat and fish, breads and cereals, fruits and vegetables, milk and dairy products) would be the source of foodborne illness (Q 7). Analysis of their responses relies on two types of comparison. The first type compares their rankings with rankings by other citizen groups. The second compares their rankings with what food and nutrition experts would judge to be the relative risks.

Respondents ranked the relative risk of foodborne illness from most likely to least likely in the following order: meat and fish; milk and dairy products; fruits and vegetables; breads and cereals. There were no significant differences in the rankings across groups, except the computer Lancaster group perceived that bread and cereals were more likely to be a food risk (compared with other respondents). These results are similar to those reported by Kramer and Penner (1986) for residents of Kansas who also ranked meat and dairy (in that order) as the foods of most concern when evaluating the risk of foodborne illness. This order is not surprising considering the major consumer concerns documented by the Food Marketing Institute (FMI) in their 1991 consumer survey (Wolfe, 1992). In the FMI study, respondents indicated that pesticide residues and antibiotics and hormones in poultry and meat were the most serious food hazards. Since that survey, the news media have highlighted safety issues in the poultry and red meat industry that may have contributed to our sample's ranking of meat and fish and milk and dairy products above fruits and vegetables. Our respondents' ranking also may reflect more media coverage of microbial food safety issues in the last several years.

We could find no survey of food industry or federal agency personnel that examined their assessment of risk associated with these food groups. Available surveys asked them to rank larger issues. In the experts' judgment the two top food hazards were microbiological and pesticides. This suggests they would rank the order of risk associated with food groups similar to the ranking provided by our consumers.

Each group was asked the likelihood that illness would be caused by various stages of food production (Q 8). The overall rankings were not statistically different across groups for this question. However, they thought some stages of production contributed more to foodborne risk. All groups rated each stage of production nearly the same, except for "the store". (Recall that this subsample has only a small number of observations.)

Our respondents consider the likelihood of foodborne illness being caused at home, in the store or in the processing plant to be lower than the risk during transportation and storage. This contrasts with the respondents in the Kramer and Penner study who indicated the processing plant was the most likely site of contamination of meat products. Part of the difference may be that our respondents ranked the relative risk from farm to home for food in general rather than for a specific food or food group.

Our WIC and EFNEP professionals (the Lancaster group) ranked "in the store" as a medium risk compared to our other respondents ranking "in the store" as a low risk. This difference was significant and probably reflects the WIC and EFNEP professionals' awareness of cross contamination that can occur at supermarket deli and meat counters. Our respondents perceive the risk of foodborne illness developing in the home as low, suggesting that familiarity and a feeling of personal control still lead to the misconception that what we do ourselves carries less risk.

During our informal follow-ups some participants revealed confusion about Q8. Many participants were unsure or unaware what the stages of food production entailed. Many participants were aware of the farm, but had no understanding of the types of processing and handling required of food products. Many participants thought that most products were marketed directly to grocery stores from farms and did not go through an elaborate process. Therefore, many participants thought the store was the process and that many foods came from a store rather than a production process.

Similarly, we could find no survey that indicated where in the food production chain food processors or federal agency personnel felt the greatest danger was. However, anecdotal talk (e.g., at professional conferences) suggests they think the most likely place for foodborne illness is in the home (or church potluck), followed by restaurants. Food processors and federal employees tend to feel that they are taking actions to prevent foodborne illness at the manufacturing and processing level.

We could find no surveys of nutrition professionals' rankings of food safety hazards. We assume they would rank the risk associated with food groups or with linkage points in the food production chain in a manner similar to that of food processors and federal employees.

<u>Views about How Government Handles Food Risks</u>. When asked how well state and local governments were keeping our food supply safe, all groups gave "fair to poor" ratings (Q 3). Most groups rated federal agencies and Cooperative Extension as doing a "good to fair" job (Q 4). However, the Personal group differed significantly by rating federal agencies and Cooperative Extension as doing a "fair to poor job". A possible explanation for this lower rating may be the background of the groups. In all but the Personal group, participants tended to be aware of the Cooperative Extension. For example, the Rose group has enlisted the support of Cooperative Extension personnel in past functions and meetings for presentations and recommendations concerning gardening practices.

The Lancaster group (nutrition paraprofessionals) works with local government agencies including Cooperative Extension in identifying and aiding their clientele. Because Cooperative Extension home economists are involved in issues related to nutrition and preparation of foods, the Lancaster group already was familiar with Cooperative Extension's role and function.

These past exposures mean that both the Rose and Lancaster groups were aware of Cooperative Extension. On the other hand, the Personal group had virtually no awareness of the Cooperative Extension and its role.

Another reason for the difference in ratings across groups is that the Personal group receives less information about food safety (Q 11). A large share of food safety materials are prepared by federal agencies and Cooperative Extension. This means that people who report receiving food safety information are likely to have seen some prepared by these sources. The visibility that food safety materials bring to their sponsors apparently contributes to higher ratings assigned to federal agencies and Cooperative Extension.

Some participants of the Personal group indicated that because they had not heard of Cooperative Extension doing community work, the agency must not be doing a good job. As with marketing and public relations in both the public and private sector, visibility plays an integral role in forming perceptions of the quality of goods and services.

Getting Information About Food Safety. Participants were asked to indicate their first and second choice as to **where** they would like to find food safety information (Q 12). For all groups, supermarkets were the number one choice for locating and obtaining food safety information. See Chart 1. Using a telephone to order and obtain information was a distant second. The other categories -- government buildings, shopping malls, libraries and post office -- received little or no expressions of preference.

Chart 2 shows that Participants preferred pamphlets and television programs as the **medium of delivery** (Q 13). They also indicated a preference for newspapers, but not as much as for pamphlets and TV programs. In the informal discussions, most participants wanted to be able to obtain pamphlets at the supermarkets. Many wanted these pamphlets to be located at the checkout counter or attached to the food products.

Respondents expressed little or no preference for the other options posed as a medium of delivery. During our informal discussion participants indicated that the use of a computer, video tape, or personal telephone call to an expert were likely to be less convenient than their top three choices. Many participants wanted a source of information that they could read or observe at their leisure, and that would allow them to quit at any point and later pick up where they left off.

## Post-Exposure Perspectives

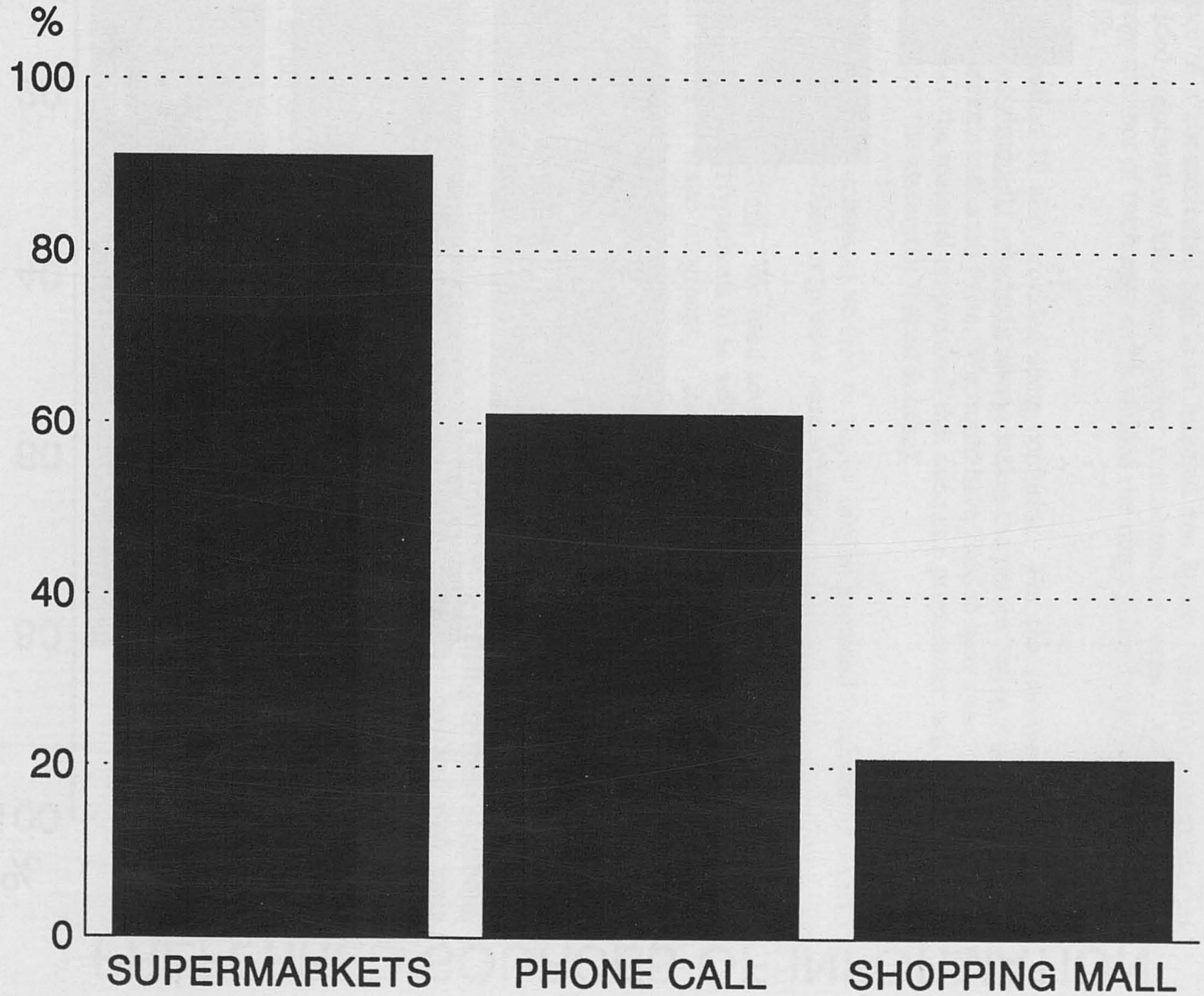
Respondents answered a second set of questions after seeing the materials about Salmonella.

Knowledge. When considering the likelihood of getting sick from Salmonella, respondents thought the probability was only somewhat likely (Q 21). Individuals in both the computer Rose and computer Lancaster groups thought that it was even less likely that they would get Salmonellosis. Before they participated in the demonstration, these groups had indicated less knowledge about food safety.

After describing Salmonella risk and what has been done (and what the reader can do) about it, we asked seven questions concerning the material. The purpose of these questions was to assess how well the participants learned about Salmonella. Regardless of group, participants scored similarly.

Chart 1

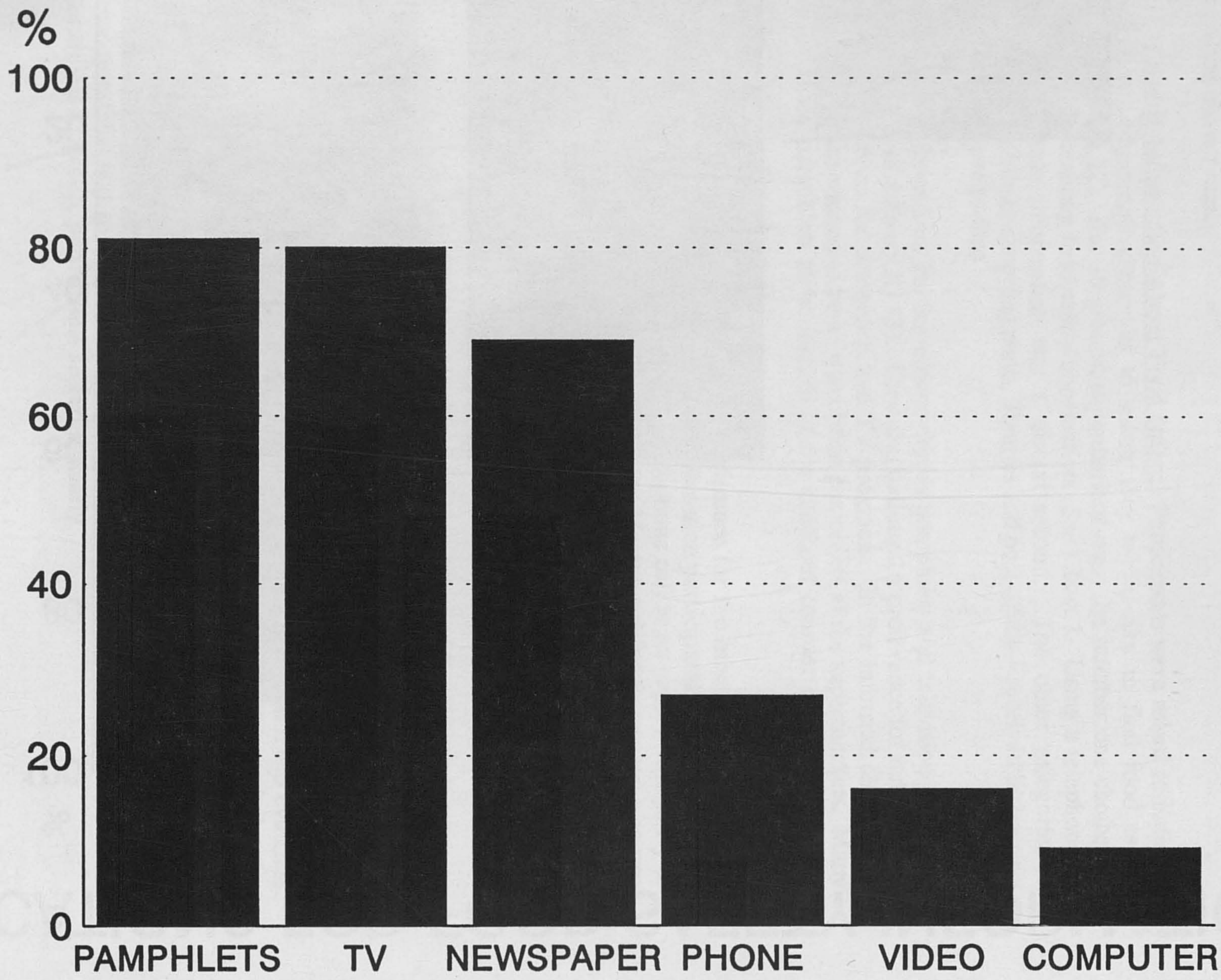
# LOCATIONS FOR FOOD SAFETY INFORMATION




(Sample size = 102)

Chart 2

## PREFERRED SOURCES OF INFORMATION




(Sample size = 108)

Only two questions had a correct response rate of less than 90%. One of these was Question 15, which tests whether they know the chance of obtaining an egg that has been contaminated with Salmonella. Overall, 77% of the participants indicated answer 2 (Between 1 in 2 and 1 in 100), which is the correct answer. Another 14.5% indicated answer 3 (1 in 1000). The text reported that one study cited a 1 in 10,000 chance of a contaminated egg in an infected hen house. However, other studies provided information indicating higher contamination rates. Adjusting for the average number of fresh eggs eaten yielded the range given in the text: 1 in 2 to 1 in 100.

Question 19 also provided some confusion. For the statement that an egg containing Salmonella enteritidis always makes the person eating it get sick, 85% of the respondents indicated False. We would have liked to have seen this figure much higher since the material emphasized that adequate preparation will render the egg safe (so that the statement indeed is false).

Neither the computer version or paper version provided feedback to explain why incorrect true-false responses were wrong.

Prompting Effect. We used several sub-groups in an attempt to measure a prompting effect (Hypothesis 6) as well as a baseline of knowledge (for Hypotheses 1 and 2). For some subgroups, a short questionnaire was given out before the presentation of materials concerning Salmonella and risk perceptions. The answers were compared to those for identical questions presented in the materials. We did find evidence of learning, as shown in Table 3. The "with prompting" column indicates subgroups that saw the quiz questions (Q 14 - Q 21) before the materials. The apparent difference for the computer groups could be misleading because of small sample sizes in these subgroups. We thought that the preliminary questions would encourage participants to seek out information pertaining to these questions. We found very little evidence to support a prompting effect involved with these materials. Comparing their "after" scores with the "after" scores for those who were not prompted shows similar levels of performance (88 percent and 87 percent for the paper group). Thus the data do not support a prompting effect, at least for the quiz questions we asked. The "after" scores are significantly higher than the before scores (e.g., 88 percent and 87% correct after reading the paper version, compared with 73 percent correct before reading the materials). Thus the materials do contribute to learning about Salmonella risk.

| TABLE 3: Prompting and Learning | | |
|---|---|---|
| | WITH PROMPTING | WITHOUT PROMPTING |
| PAPER | | |
| Before | 73% (32) | -- |
| After | 88% (32) | 87% (35) |
| COMPUTER | | |
| Before | 64% (9) | -- |
| After | 100% (9) | 91% (16) |

Note: Average share of factual questions correct. Figure in parentheses indicates number of respondents, so we have more confidence in the results for the paper version.

Judging Options. Respondents were asked two questions, each of which involved two options about managing food risk. When given a choice between increasing inspections and sanitation practices at poultry farms that would increase the cost of eggs by 65 cents a dozen versus better sanitation practices at home (Q22). The majority of respondents preferred better sanitation practices at home.

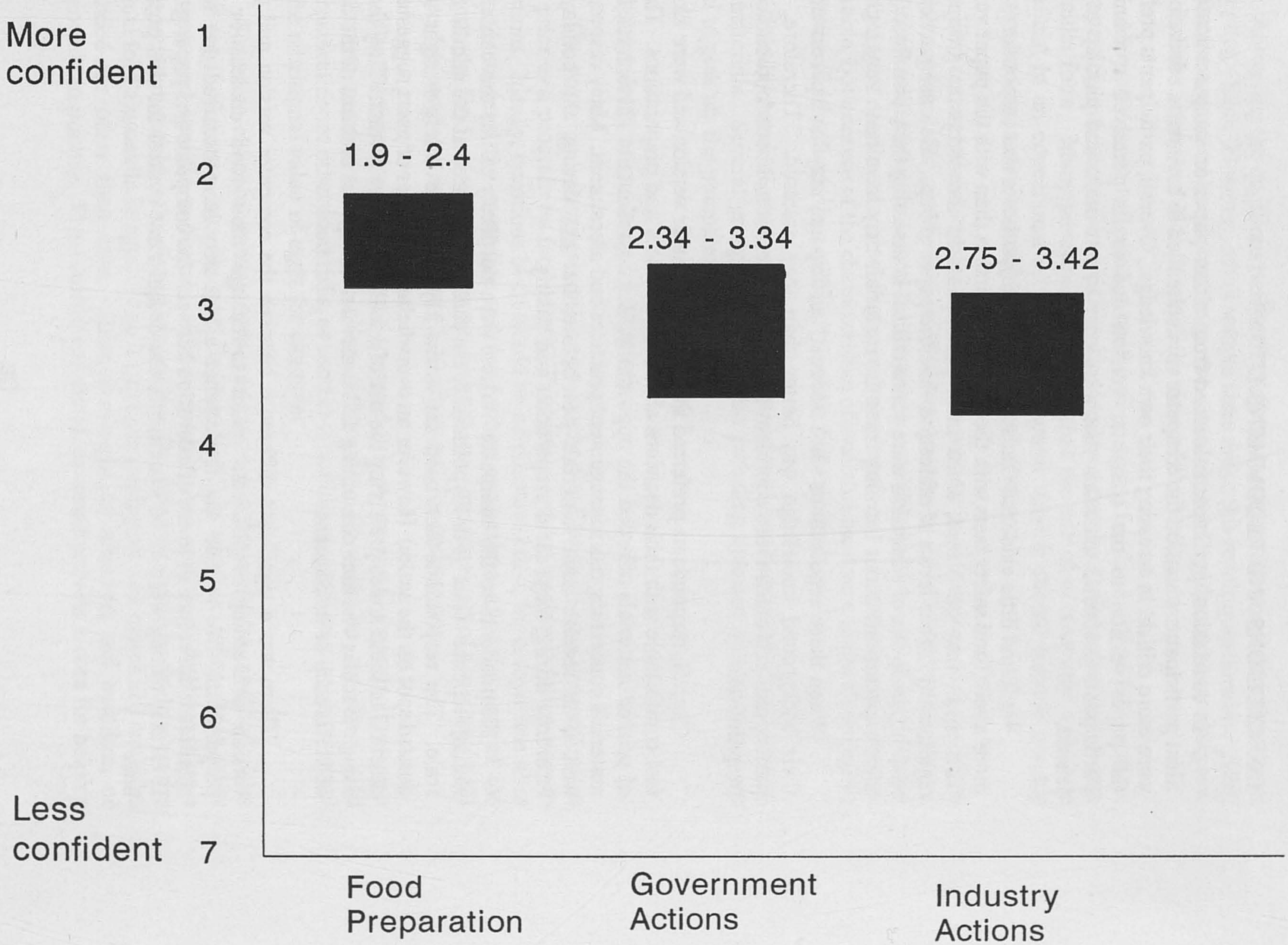
When asked about whether restaurants should use pasteurized eggs versus requiring that food handlers have more training (Q23), respondents were split. Both options involved increasing costs for producers and providers, therefore the prices to consumers also would increase. These options received criticism from some participants because the choice did not allow for a no-intervention option or a no-cost option.

Judging the Materials. All groups found the information to be easy to understand (Q 24). In addition, all groups found some new information (Q 25). However, both computer and paper Rose groups wanted more information and wanted all information to be brief and exclude calculations. In the informal discussion, some participants indicated that the materials would be more helpful if they were even briefer and more concise. Many participants were confused and distracted by the risk calculations and recommended that they be dropped from the materials. In general, most participants wanted a short definition of the foodborne illness, its likelihood, and what to do about it.

Improving Confidence. The materials were effective in boosting confidence in the participants' abilities to choose or prepare safe foods (Q 26). See Chart 3. After reading the materials most participants also became much more confident in the actions taken by government and the food industry (Q 27).

Chart 3

# CONFIDENCE RATINGS



## CONCLUSIONS AND RECOMMENDATIONS

In conclusion, participants learned from either paper or computer materials. Most participants who used the computer version tended to have more education and were more critical in assessing their own knowledge. Overall, participants preferred the paper version to the computer version due to its perceived convenience. Participants preferred materials that were easy to put down and pick up at their leisure.

We found little evidence that supported our hypotheses that respondents learn more about food safety facts with the computer version than with the paper version. This result may be biased, since most participants in the computer groups had significantly higher levels of education than the paper groups. Because participants with higher levels of education were more critical in assessing their own knowledge, their expectations about learning from the materials may have been very high.

When these expectations were not met, participants may have perceived that their background knowledge was better than they assessed. Therefore, these participants felt much more confident in their own decisions about food choice and preparation.

Overall, respondents preferred the use of the paper version and were likely to feel comfortable with their decisions about food choices and preparations. The use of printed materials afforded the opportunity for respondents to check back in the materials concerning risk management practices and assessment. Many respondents wanted to receive such materials just before, but <u>not</u> during, the holidays for reference during large meal preparation and baking.

Respondents to the computer version were not likely to use the center of a sliding response scale. (For Hypothesis 5, the cursor was placed at the middle of the scale. The respondent then used the arrow keys to move it left or right to the desired spot on the scale.) However an overwhelming number of users suggested the deletion of these scales preferring the use of a multiple choice format. They thought using the scales was time consuming and somewhat ambiguous in terms of the degree of preference or assessment.

There was a significant difference between the computer version and paper version concerning respondents' plans to change their food choices or food preparation. We remind the reader that a bias may have occurred due to the significant difference in levels of education between the computer and paper groups. If further testing were to be conducted, the design must control for this potential bias.

Answering the questions before reading the materials did not yield a significant prompting effect. However, small sample sizes make this result questionable. Also, media coverage could have biased responses, due to recent legislation concerning raw eggs in New Jersey and New York at the time of the testing.

All participants indicated a need and a desire for food safety information. Most participants wanted materials to be readily accessible, at the supermarket in a pamphlet form. Many participants thought that the use of a computer would be beneficial in an educational setting. A computer version should include graphic features and maintain its positive reinforcement features.

The computerized version needs to be written in a language that could be easily translated for use by either IBM compatible or MAC computer systems. Graphic features are limited to the hardware available to the user. Graphics are only as good as the machine they are being used on. Therefore graphics are desirable, but because of the characteristics of available hardware in the Cooperative Extension field offices, they will likely not be fully realized.

Participants indicated preference for pleasing pictures and incentives for using the materials. Several groups indicated that including coupons would encourage them to pick up the pamphlet.

Recommendations for Using the Materials

The paper or computer versions presently could be used as a preassessment tool prior to a program on food safety. This would require tracking of responses to questions. Ideally, questions 14-21 would be administered first, for comparison after respondents read the materials and for further comparison after the rest of the program on food safety. It might be desirable to administer all of Questions 1-21 before the program, and Questions 1-30 afterward, for comparison.

The information section itself (pages 5-9 in Appendix D) stands alone as a handout to provide information about Salmonella. It could be combined with information about other food risks, or used as a cautionary supplement to a program on the nutritional value of eggs, for example.

For more extensive use, the pre- and post-questions could be modified. The cover page, of course, was designed for our study. It could be tailored for other purposes and specific audiences. More extensive use would be facilitated by a background manual for the discussion leader. The first step would be to develop the manual for Salmonella in eggs. Then it (and accompanying user materials) could be extended for other food risks. Examples might be aflatoxin and botulism, or Salmonella in poultry. These additional materials would provide a core for helping users understand how food risks are evaluated and how food safety policies safeguard the American public. The core also would be a basis for stressing the public's opportunities to reduce food risks at the individual consumer or household level.

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**APPENDICES**

| | |
|---|---|
| Appendix A: | A.1 Protocol for Focus Groups<br>A.2 Summary of Results |
| Appendix B: | Materials for New England Cooperative Extension Pretest |
| Appendix C: | Summary of Follow-up Comments<br>C.1 New England Pretest Comments<br>C.2 Questions for Pilot Test Informal Follow-up<br>C.3 Summary of Comments from Rose Society Pilot Test<br>C.4 Summary of Lancaster Pilot Test Comments<br>C.5 Comments from Personal Interviews |
| Appendix D: | Pilot Materials: Copy of Paper Version, Copy of Computer Version |

# APPENDIX A.1

## FOCUS GROUPS PROTOCOL / SCRIPT OF QUESTIONS

Introduction

Purpose of focus groups

Topic of present study

Procedures today

general introduction to materials

read materials and respond to written questions

talk about responses and reactions (tape is to help us; you won't be identified by name to anyone else except the research team)

Distribute one set of materials (salmonella first); allow time for reading/response

Discussion Questions

What was your overall reaction?

Were the materials worth reading?

How much did you learn?

Do you feel more comfortable, or less comfortable, about these three food safety issues?

What questions do you still have?

What words or concepts did you find difficult to understand?

How can we make the materials more useful for the reader?

Which material could be cut?

Do the pictures help? More? Fewer? Different ones?

Do you think your mother or brother would understand this?

Would they find it worth reading?

Repeat "distribute" and "discussion" steps for aflatoxin and botulism

Final thoughts

Would they participate again?

Our next steps

Thank you for your help

## A.2 Summary of Focus Group Comments

Two focus groups were held November 19, 1991. Participants were recruited from AG EC 201 (Environmental and Resource Economics). Students taking this course are at least sophomores, so have more background in science than the general public.

Eleven students participated in Focus Group 1. Twelve participated in Focus Group 2.

Three members of the research team attended both sessions. One additional team member observed Group 1 and another observed Group 2.

The sessions were (audio) taped so the research team could clarify their notes. Different moderators were used, but followed the same protocol as outlined.

Because these students volunteered to participate, we explained what focus groups are and the role of these focus groups for the Extension Service project. This was intended to provide an educational component for them: to enhance their understanding that social science research uses qualitative research methods in addition to the quantitative methods described in some of their courses.

**THE FOCUS GROUP DISCUSSIONS:**

**SALMONELLA**

Salmonella was the first section reviewed by Group 1. It was the second section read by Group 2. Reading and answering the questions took approximately 20 minutes. The following summarizes the focus group discussions:

**COMMENTS FROM BOTH GROUPS:**

1. People agreed this section was too long and needed to be shortened.

2. Members were asked how concerned they were about Salmonella after reading the materials. In Group 1, four would worry more and one would worry less. In Group 2, two would worry more. The remainder were unchanged.

**COMMENTS FROM FOCUS GROUP 1:**

1. Some members wanted to know if Salmonella would be the only issue covered.

2. The material was interesting.

3. Many had read similar information before.

4. One asked why the Salmonella rate was so high in the Northeast and suggested an explanation be included.

5. A member asked if only grade A shell eggs were involved, and suggested discussing all grades. Others argued that consumers can only buy grade A shell eggs so the issue was moot.

6. They commented about redundant information, especially concerning preparation, refrigeration, and non-healthy versus healthy people.

7. One person wanted to know what steps farmers could take to cure infected hens.

**COMMENTS FROM FOCUS GROUP 2:**

8. They wanted more on what state and local governments and Cooperative Extension agents are doing. (E.g., health inspection of restaurants and food handling operations, Pen Pages).

9. They have not seen much information on this issue.

10. What information is the government required to tell consumers?

11. The section is way too long. Prefer a one-page "do's and don'ts."

12. The range calculations were confusing. Report the results and be more explicit about disagreement/uncertainty. Members were not concerned about the source of the information. Many would just accept the range.

13. One wanted more information about the sampling technique.

14. Some thought the issue was scary.

15. Makes you stop and think and emphasize preparation.

16. What about diarrhea?

17. what about imported foods?

18. The "box" with hen house calculation should be cut.

19. SE is not a good acronym. Use Salmonella instead.

**BOTULISM**

Botulism was the third set of materials for Focus Group 1 and the first set for Focus Group 2. Each group took approximately 15 minutes to read the materials and answer the questions.

**COMMENTS FROM BOTH GROUPS:**

1. The section on symptoms was good. They wanted it expanded to include the timing and duration of symptoms and to tell people when to go for medical care.

2. Did not know that botulism is more likely in low acid foods.

**COMMENTS FROM FOCUS GROUP 1:**

1. Members commented about the acidity factor and talked about its importance.

2. The first question needs to be rephrased.

3. One wanted to know if the bacteria, spores, and toxin were visible.

4. They wanted to know if someone affected by Botulism would recover fully.

5. Some thought that botulism information was now more important than ever.

6. They wanted more on what visual cues cans might have.

**COMMENTS FROM THE FOCUS GROUP 2:**

7. They wanted longer lists of foods involved in outbreaks.

8. People may not be aware of how long home-canned foods should be boiled before serving.

9. Some did not know this was a problem.

10. Some were shocked that 8 ounces could kill everyone.

11. They did not know that the toxin becomes harmless if canned foods are boiled for ten minutes before eating.

12. What is meant by an outbreak?

13. Makes you stop and think about canned goods.

14. Very informative and easy to read.

15. Want more information about what industry is doing to prevent botulism.

16. There was confusion concerning government and private issues.

17. Pictures were not much of an impact. The jar and can should be moved to next page.

18. Make clearer that when there are signs of something wrong, throw it out (apparently there have been some signs every time there has been an incident.)

19. Elaborate on treatment if prevention should fail.

**AFLATOXIN**

The aflatoxin section was the last to be reviewed by focus Group 2 and the second to be reviewed by Focus Group 1. The section took approximately 10 to 15 minutes for each group.

**COMMENTS FROM FOCUS GROUP 1:**

1. Very few participants had heard of aflatoxin.

2. The word cancer made an impact on at least one member.

3. Most learned a lot from this section.

4. The group was in agreement about not buying cheaper brands of peanut butter because cheaper brands tend to contain more aflatoxin.

5. Liver cancer was a major concern for one member because the chances of survival were thought to be slim.

6. One wanted to know why there was in increased incidence of aflatoxin since 1972.

7. Are shelled peanuts safe to eat? Are shelled peanuts used for fresh or homemade peanut butter safe?

8. What about the accumulation effect from eating shelled peanuts?

9. In general, members agreed that this section was more organized than the Salmonella section because headings were underlined.

10. Most appreciated the use of pictures to maintain their attention.

11. They thought that the ppb concept needed to be explained.

12. Some felt they had no control over aflatoxin.

**COMMENTS FROM FOCUS GROUP 2:**

13. Why the difference in the allowed limit for milk versus peanut butter and grains?

14. Are farmers doing anything to prevent aflatoxin?

15. Perhaps compare cancer risk from aflatoxin with cancer risk from all causes.

16. Why is milk more affected by feed than meat?

17. Poison versus carcinogen issues.

18. They expressed faith in Consumer Reports.

19. If peanut butter is made from roasted peanuts, why isn't aflatoxin destroyed?

20. "Let the powers that be worry about it; I am not going to worry about it." Many felt a lack of control at an individual level. Others disagreed with this outlook.

21. Need more about where to get follow-up information.

22. The risk example confused some.

**IN GENERAL:**

After each focus group had gone through all three modules, the moderator asked for their overall reaction.

1. The aflatoxin section was the easiest to read.

2. If scales are used like pH and ppb, it is necessary to explain the scales.

3. Use bold and/or underline for sections headings. This makes it appear more organized.

4. The pictures help maintain interest.

5. Present a summary at the end of each module.

6. Most participants thought their families would be able to understand the material as is.

7. The section on Salmonella has to be shortened.

# APPENDIX B - Materials Used in New England Pretest

PENNSTATE

1855

Department of Agricultural Economics
and Rural Sociology
College of Agriculture

(814) 865-0469 FAX (814) 865-3746
Weaver Building
The Pennsylvania State University
University Park, PA 16802

**DRAFT**

# Understanding Food Safety Policy Issues

Objective: To develop and evaluate the effectiveness of alternative pilot materials for helping consumers appreciate risk assessment methodologies and risk management decisions for food safety.

For Further Information Contact: Dr. Ann Fisher
Department of Agricultural Economics and Rural Sociology
The Pennsylvania State University
Weaver Building
University Park, Pa. 16802

Sometimes, people get sick from the food they eat. This is called food-borne illness. We can reduce food-borne illness by improving the safety of foods and how they are handled. The materials below describe how we know about the threats to food safety and how we can reduce the likelihood of food-borne illness.

First, please answer a few questions about food and food safety. Please choose the answer that reflects what you think; don't worry about agreeing with others or being right or wrong.

1. How often do you eat peanut butter?

   a. more than once a week
   b. once a week
   c. about once every two to four weeks
   d. rarely; less than once a month
   e. never

2. How often do you eat cornmeal products (such as corn chips, breakfast cereals and cornbread)?

   a. more than once a week
   b. once a week
   c. about once every two to four weeks
   d. rarely; less than once a month]
   e. never

3. How often do you eat eggs?

   a. more than once a week
   b. once a week
   c. about once every two to four weeks
   d. rarely; less than once a month
   e. never

4. How often do you eat canned goods?

   a. more than once a week
   b. once a week
   c. about once every two to four weeks
   d. rarely; less than once a month
   e. never

5. Compared with other health and safety risks such as car accidents, chemical production, home fires, and heart disease, do you think food-borne illness is:

   a. not a problem
   b. a minor problem
   c. a slightly serious problem
   d. a very serious problem
   e. don't know

6. Rate the job being done by federal government agencies (United State Department of Agriculture (USDA), U.S. Food and Drug Administration (FDA), and U.S. Environmental Protection Agency (EPA)) to keep our food supply safe.

| | Very good | Good | Fair | Poor | Very Poor | Don't Know |
|---|---|---|---|---|---|---|
| FEDERAL GOVERNMENT AGENCIES | | | | | | |

7. Rate the job being done by the following groups to inform the public about food safety issues:

| | Very Good | Good | Fair | Poor | Very Poor | Don't Know |
|---|---|---|---|---|---|---|
| STATE & LOCAL GOVERNMENT | | | | | | |
| COOPERATIVE EXTENSION AGENTS | | | | | | |

8. In the past three months, have you read or heard anything about food-borne illness (such as salmonella, contaminated fish, bad vegetables)?

a. yes →→→ continue with question 9.
b. no →→→ go to question 10.

9. Where did you read or hear the information? (Put an X by all that apply)

_____ a. local TV coverage
_____ b. national TV program
_____ c. at work
_____ d. local newspapers
_____ e. national newspaper
_____ f. magazines
_____ g. friends and family
_____ h. other ____________________________

10. How much do you feel you know about food-borne illness?

a. very knowledgeable
b. somewhat knowledgeable
c. know a little
d. no knowledge

11. Food-borne illness can be associated with different food groups. Rank the food groups using number 1 as the <u>most likely</u> to number 4 as the <u>least likely</u> in causing a food-borne illness:

____ Meat and fish

____ Breads and cereals

____ Fruits and vegetables

____ Milk and dairy products

12. What is the likelihood that food-borne illness is caused during each of these stages of production, marketing, and use of food? (Check only one column for each row.)

| | High | Medium | Low | Not At All | Don't Know |
|---|---|---|---|---|---|
| At the farm | | | | | |
| At the processing plant | | | | | |
| During transport | | | | | |
| During storage | | | | | |
| In the store | | | | | |
| At home | | | | | |

13. Have you ever had food-borne illness?
a. yes
b. no
c. not sure

14. Has any friend or family member had food-borne illness?
a. yes
b. no
c. not sure

15. Do you regulary see or receive food safety information?
a. often
b. sometimes
c. rarely or never

16. Please mark the number 1 by your first choice of where you would like to find food safety information and 2 by your second choice:
_____ a. supermarkets
_____ b. government buildings
_____ c. shopping malls
_____ d. libraries
_____ e. telephone book number to call so information can be mailed to me
_____ f. post office

17. Food safety information can be presented in several ways. Mark the number 1 by the one you would most like to use, 2 by your second choice, and 3 by your third choice.
_____ a. on a computer
_____ b. a pamphlet
_____ c. television program or public service announcement
_____ d. newspaper
_____ e. video tape
_____ f. other_______________
_____ g. personal telephone call to expert

Thank you for answering these questions. We hope that the following information will help you make more informed choices about foods you prepare or eat, and understand the basics of food safety policies.

## SALMONELLA: ONE SOURCE OF FOOD-BORNE ILLNESS

Food-borne illness has several possible causes. One cause is a family of bacteria called Salmonella. The bacteria can be found in the intestinal tracts of livestock, poultry, pets, and other animals. Rarely is it found in healthy humans.

Salmonella cannot be seen, smelled, or tasted, so it is difficult for the consumer to detect contaminated food. People can get sick from eating food that contains sufficient numbers of salmonella. Sometimes, the bacteria are destroyed by acid in the stomach. Bacteria that make it past the stomach can multiply in the intestine.

Within 6 to 48 hours after the food was eaten, there can be enough Salmonella in the small intestine to cause stomach pain. Other symptoms include nausea, vomiting, chills, diarrhea and fever. Most people recover without antibiotic treatment. The symptoms usually last from 3 to 5 days. Sometimes, the symptoms are severe enough to require hospitalization. The only accurate way to know whether a person's illness is from Salmonella is to test the stool (feces) in a laboratory.

Eggs have been linked to an increase in infections by a specific strain of Salmonella, called Salmonella enteriditis. All shell eggs, both brown and white, occasionally have this strain of Salmonella inside the shell. A contaminated egg could cause a single case of illness if eaten by just one person. That egg could cause an outbreak affecting many people if it is used in improperly prepared or handled food eaten by a group. Fortunately, the heat from thorough cooking destroys Salmonella in eggs.

## HOW EGGS BECOME CONTAMINATED

During the 1960s and 1970s, Salmonella typhimurium was the predominant strain that caused illness from eggs. This came from feces and other environmental sources contaminating the outer shell. In the early 1970s Federal grading and egg washing and sanitizing programs were implemented that dramatically reduced this source of infection.

Today, a different strain of Salmonella poses a risk of food-borne illness. This one, Salmonella enteriditis, has been linked to an infected hen laying a contaminated egg. The bacteria are located inside the egg shell, so disinfections and inspections cannot guarantee Salmonella-free eggs.

Infected hens can lay safe eggs for a long time. Then without any symptoms, the hen will lay contaminated eggs for a brief time. This short period will then be followed with a long cycle of uncontaminated eggs.

Scientists have been investigating whether the Salmonella problem can be linked to specific varieties of laying hens, to feed or feed ingredients, to breeder practices, or to management practices. So far, they have not been able to determine why some laying hens become infected with Salmonella enteriditis. Scientists have found that the bacteria are more common in hens and eggs in the northeastern United States.

## HEALTH RISK

The risk of food-borne illness is highest in elderly persons, infants, pregnant women, and people with illnesses that impair their immune system's ability to fight infections. In these people, a relatively small number of Salmonella bacteria could cause illness. It usually takes a much larger number of bacteria to cause illness in healthy people.

High-risk groups can have a more severe illness. Their infection can spread from the intestines to the bloodstream, and then to other parts of the body, such as the joints or the spinal cord. The infection can even cause death in these people unless promptly treated with antibiotics.

In general, the illness is more severe when more Salmonella bacteria are consumed. A small dose in a healthy individual might cause mild illness or no illness at all, although the bacteria can spend several weeks in the person's intestine before disappearing.

Infection with Salmonella enteriditis results from a failure in the chain of producing/processing/distributing/preparing/consuming of eggs. The likelihood of getting sick depends on the chance that eggs eaten are contaminated with the bacteria and the chance that the egg is handled and prepared in a way that the bacteria will survive and multiply.

This can be expressed as follows:

Likelihood of Illness = Likelihood of using a contaminated egg. X Likelihood of mishandling/undercooking an egg.

The likelihood of illness will be zero if either (or both) of the terms on the right-hand side of this equation is zero.

A contaminated egg cannot cause illness if it is not mishandled or undercooked. Similarly, raw, undercooked, or mishandled eggs cannot cause illness if the eggs are not contaminated. Let's find out more about the chances that eggs are contaminated, and the chances that they are undercooked or mishandled.

## CHANCE OF A CONTAMINATED EGG

### RAW EGGS

Eggs are an excellent source of nutrients. But raw eggs are neither healthier nor of greater nutritional value than cooked eggs.

Estimates of contamination rates vary. As few as 1 in 100 average consumers could eat a contaminated egg each year, or as many as 1 in 2 average consumers could eat a contaminated egg each year.

A Penn State University study found that 1 in 10,000 shell eggs contained Salmonella enteriditis in infected hen houses. The U.S. Department of Agriculture conducted a random survey of hen houses in the Northeastern and Middle Atlantic states. They found that 45% tested positive for Salmonella enteritidis.

The average person in the United States eats 200 eggs a year. So with nearly 50% of all hen houses having Salmonella enteritidis, if these eggs were not pooled (e.g., cracked and put into a bowl for batter) in large numbers before being eaten, then 1 out of 100 average consumers could eat a contaminated egg each year. The number can be calculated this way:

$$\frac{\text{1 CONTAMINATED EGG}}{\text{10,000 EGGS LAID}} \times \frac{\text{1 INFECTED HEN HOUSE}}{\text{2 HEN HOUSES}} \times \frac{\text{200 EGGS PER YEAR}}{\text{1 PERSON}}$$

= 1/100 RISK OF EATING AN CONTAMINATED EGG

But the number could be much larger. Another study by T.J. Humphery found an egg contamination rate of 1 out of 200 from infected hen houses. This means a 1 in 2 chance of eating a contaminated egg. A study in Great Britain estimated that 1 out of every 1000 eggs was contaminated from infected hen houses. This translates into a 1 in 10 chance each year of eating a contaminated egg.

**Remember, this cannot make the person sick if that egg is thoroughly cooked.**

There is some risk involved whenever one consumes raw or undercooked foods of animal origin. The average healthy person, even in the northeastern United States, is at low risk of Salmonella infection if he/she consumes individually prepared, properly cooked eggs that eaten promptly or foods made from pasteurized eggs.

## PASTEURIZED EGGS

Eggs can be pasteurized just as milk is. Pasteurized eggs have not been readily available for the home use, except as low cholesterol egg substitutes made from pasteurized egg whites. However, pasteurized egg whites, egg yolks, whole eggs, and mixed white and yolk products are available in large packages for commercial or institutional kitchens. Smaller packages now are appearing in supermarkets for individual and family use. Pasteurized eggs need to be handled with care, like pasteurized milk. Commercially manufactured ice cream and egg nog are made with pasteurized eggs. **No outbreaks of Salmonella have been associated with pasteurized eggs.**

## LIKELIHOOD OF MISHANDLING AND UNDERCOOKING AN EGG

### STORING EGGS

Bacteria multiply faster at warm temperatures. So, Salmonella outbreaks are highest during the summer months of June, July, and August.

Prompt and adequate refrigeration of whole eggs reduces the risk.

### EGG WHITES

It is possible for all parts of the egg, --the white, the yolk and the shell-- to contain Salmonella. Most bacteria, including Salmonella, find it difficult to multiply in egg whites because of antibacterial substances that are present there naturally, and because egg whites may lack nutrients needed for bacterial growth. However, when egg yolks and whites are mixed with other foods, bacteria from any source can multiply if not refrigerated right away.

### MISHANDLING EGGS

Bacteria on utensils, dishes and kitchen counter tops can spread and multiply in warm temperatures. Washing and rinsing utensils, dishes and surfaces with a mild detergent and hot water keeps Salmonella from spreading to other foods.

### COOKING EGGS

Individually prepared shell eggs that are eaten promptly after cooking are relatively safe even if the yolk is still soft. Eggs fried "over easy" probably are safer than eggs fried "sunny side up", because cooking reduces the number of bacteria present. For healthy people, bacteria usually must be present in high numbers in order to cause illness. For persons at high risk, even a small number of bacteria could cause illness. For those people, eggs should be hard cooked, or pasteurized egg products should be used.

## ACTIONS TAKEN BY INDUSTRY AND GOVERNMENT.

The egg industry voluntarily uses quality assurance and sanitation measures. Some states require refrigeration of eggs at each stage from the producer to the consumer.

The United States Department of Agriculture (USDA) has begun a mandatory program to test breeder flocks that produce egg-laying chickens shipped to other states, in order to be sure that they are free from Salmonella enteritidis. Also, the USDA traces back to egg laying flocks when there is a human outbreak of Salmonella enteritidis. Such a flock is tested and, if found positive, eggs from that flock are diverted for pasteurization.

The Food and Drug Administration (FDA) is preparing regulations for monitoring infection in laying hens, in case the USDA program is insufficient. The FDA already has issued guidelines or handling of eggs in retail establishments.

## ACTIONS CONSUMERS CAN TAKE

* Keep eggs refrigerated.

* Promptly refrigerate leftover foods containing eggs.

* Wash hands before handling eggs and egg products.

* Avoid eating raw eggs. This includes foods made from traditional recipes for: mayonnaise, homemade ice cream, egg nog, salad dressings, and sauces. These will be safe if they are made from cooked custard, or from pasteurized eggs.

* Wash hands, utensils and surfaces again after contact with eggs and egg products.

* Don't use cracked eggs.

* Eat eggs promptly after cooking. Don't hold them warm for more than 2 hours.

**Remember, eating eggs can be perfectly safe. Illness requires eating a contaminated egg that has been mishandled or undercooked. Most healthy people will not get sick from eating a small number of salmonella bacteria. Sensitive groups are more likely to get sick from a small number of bacteria. But, refrigeration keeps Salmonella from multiplying, washing utensils keeps them from spreading, and thorough cooking destroys them.**

**QUESTIONS**

Here are a few more questions to reinforce what you just read and to help us evaluate the effectiveness of these materials:

1. A consumer can minimize the risk of Salmonella infection:

   a. by keeping whole eggs refrigerated
   b. by washing cooking utensils properly
   c. only a and b above
   d. False; there is nothing a consumer can do about this

2. The average chance of obtaining an egg that has been contaminated with Salmonella is:

   a. 1 in 1
   b. between 1 in 2 and 1 in 100
   c. 1 in 1000
   d. Don't know

3. During what season would you expect the greatest incidence of Salmonella outbreaks?

   a. Winter
   b. Spring
   c. Summer
   d. Fall

4. Washing and disinfecting the outer shell of eggs will eliminate all Salmonella bacteria.
   a. True
   b. False

5. Cooking eggs until firm destroys any Salmonella bacteria in them.
   a. True
   b. False

## WHAT IS BOTULISM?

Caused by the most potent of all natural toxins, **botulism** is a severe paralytic disease. Approximately 10 - 20 outbreaks of food-borne botulism are reported in the United States each year. There are usually 2 to 5 deaths among the 20 to 30 people who get sick in these outbreaks.

Botulism almost always is associated with food that has been preserved to prevent spoiling before it can be eaten. Most botulism comes from foods canned at home.

## BOTULISM TOXIN

Surprisingly, the bacterium responsible for botulism is everywhere around us. It's in the soil. It's in the water we drink. The bacterium produces spores that sometimes can be found in the water we drink, and some of the food we eat.

Both the bacterium and spores (Clostridium botulinum) themselves are harmless. The bacterium dies when exposed to air or boiling water temperatures. The bacterium can enter into nearly complete inactivity when conditions necessary for ordinary life are not present. Then, it develops a protective shell so that it can lie dormant in the spore state for a long time. When conditions improve, the spore germinates and the new bacterium resumes normal activity.

Unlike the active bacteria, the spores are relatively heat resistant. Spores can survive when exposed to boiling temperatures for up to eleven hours. Time and temperature are the key controls for destroying the bacteria and spores. This is why food scientists are so firm in advising that foods being preserved be kept at high temperatures for a long time.

Unless all the spores and bacteria are killed by proper preserving, the spores will awaken from hibernation and begin to grow and multiply, happy in the watery, airless environment inside a jar or can. Storing canned food for a long time allows the bacteria to multiply in improperly canned foods. When there are many bacteria they produce a toxin called botulin. This is when the trouble begins.

Botulin is believed to be the fiercest toxin in the world. The venom of a rattlesnake or cobra are mild in comparison. Eight ounces of botulin would be enough to kill every man, woman and child on this planet.

Fortunately, the toxin can be destroyed by intense heat. Thus, preserved foods that are contaminated with botulin become safe if they are recooked. The toxin in foods will be destroyed when exposed to a boiling temperature for 10 minutes.

## CONDITIONS NEEDED FOR AN OUTBREAK

An outbreak can occur only if all of these things happen:

1. The bacteria that can cause botulism must have been in the fresh food.

2. The food must have been canned or heated in some way.

3. Inadequate processing of canned foods or heating of fresh food permited spores to survive.

4. Storage allowed the surviving spores to germinate and their cells to grow and produce toxin.

5. The food was not reheated enough before eating to destroy the toxin.

6. The poisonous food was eaten.

The bacterium grows best with very little oxygen in its environment. When food is heated, as in canning, the air containing the oxygen is driven out by the process. Anaerobic (without oxygen) conditions are established when the container seals. The absence of air prevents the growth of other micro-organisms but not of Clostridium botulinum.

## FOODS INVOLVED

Most botulism outbreaks involve vegetables. Fruits are second, followed by fish, condiments, beef, milk, pork, and poultry. In almost every instance, the foods had been canned, stored for some time, and then consumed later. In a few recent outbreaks fresh or frozen foods were prepared, heated and then held unrefrigerated several days before eating.

## WHAT AFFECTS THE AMOUNT OF TOXIN?

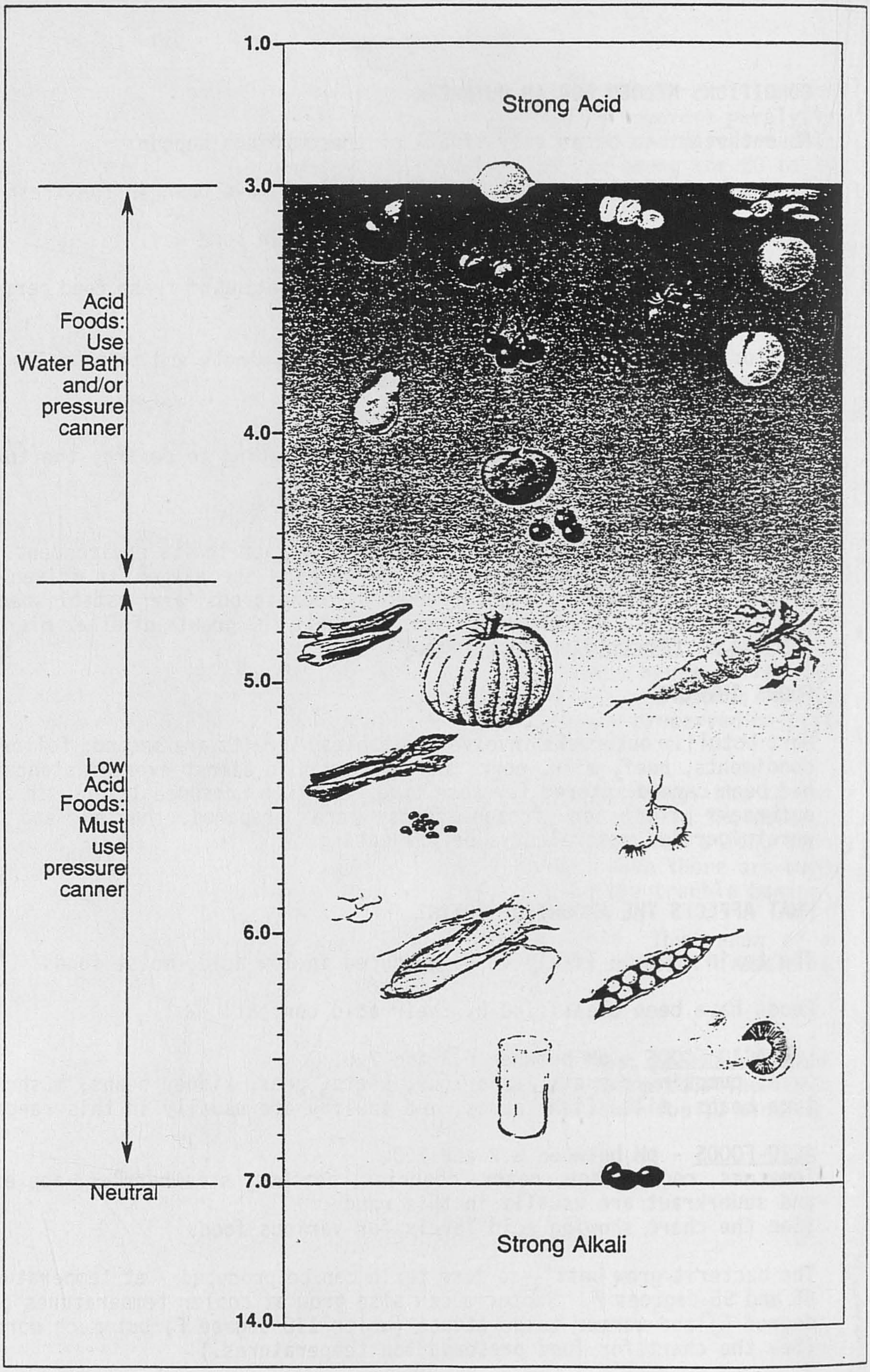
The toxin is more likely to be produced in low acid, moist foods.

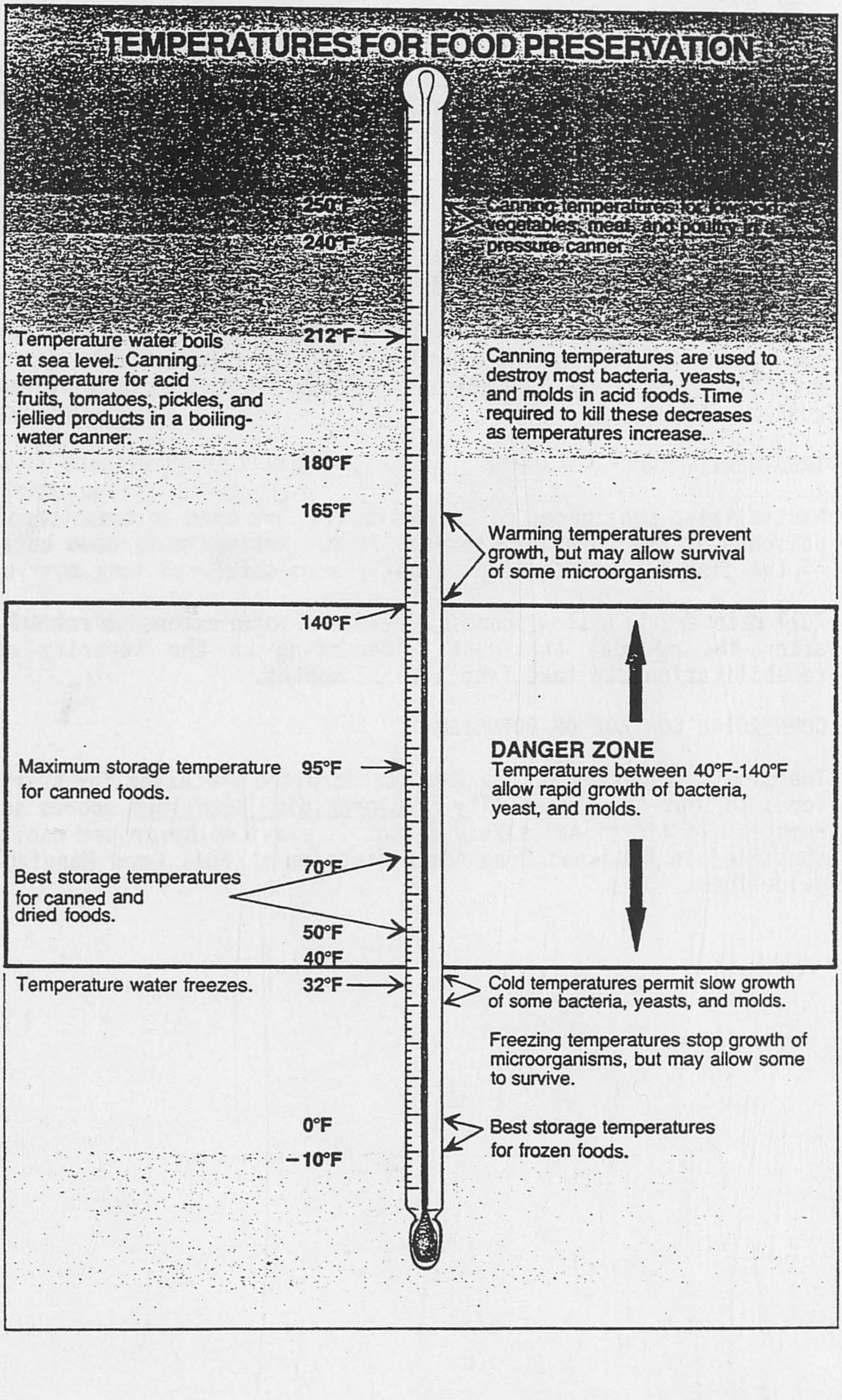
Foods have been classified by their acid content:

LOW-ACID FOODS - pH between 5.3 and 7.0.
Okra, pumpkin, carrots, asparagus, beets, peas, kidney beans, mushrooms, corn, lima beans, milk, fish, meats, and poultry are usually in this range.

ACID-FOODS - pH between 5.2 and 7.0.
Tomatoes, red cabbage, pears, cherries, peaches, strawberries, apples, berries, and sauerkraut are usually in this range.
(See the chart showing acid levels for various foods.)

The bacteria grow best --so more toxin can be produced-- at temperatures between 86 and 95 degrees F. Bacteria can also grow at cooler temperatures (down to 38 degree F) and warmer temperatures (up to 118 degree F) but much more slowly. (See the chart for food preservation temperatures.)


1.0
Strong Acid
3.0
Acid Foods: Use Water Bath and/or pressure canner
4.0
5.0
Low Acid Foods: Must use pressure canner
6.0
7.0
Neutral
Strong Alkali
14.0


TEMPERATURES FOR FOOD PRESERVATION
250°F
240°F
Canning temperatures for low-acid vegetables, meat, and poultry in a pressure canner.
212°F
Temperature water boils at sea level. Canning temperature for acid fruits, tomatoes, pickles, and jellied products in a boiling-water canner.
Canning temperatures are used to destroy most bacteria, yeasts, and molds in acid foods. Time required to kill these decreases as temperatures increase.
180°F
165°F
Warming temperatures prevent growth, but may allow survival of some microorganisms.
140°F
DANGER ZONE
Temperatures between 40°F-140°F allow rapid growth of bacteria, yeast, and molds.
Maximum storage temperature for canned foods.
95°F
Best storage temperatures for canned and dried foods.
70°F
50°F
40°F
Temperature water freezes.
32°F
Cold temperatures permit slow growth of some bacteria, yeasts, and molds.
Freezing temperatures stop growth of microorganisms, but may allow some to survive.
0°F
−10°F
Best storage temperatures for frozen foods.

## SYMPTOMS

Depending on the person's health and how much toxin was in the food he or she ate, botulism can occur within 1 to 3 days after eating contaminated food. First, voluntary muscles (e.g. arm and leg movement) lose control. Then, involuntary muscles (heart and lungs) stop functioning.

Symptoms do not occur in a set order, but early signs of botulism are fatigue, weakness, dry mouth, and dizziness. These are usually followed by double and/or blurred vision and progressive difficulty in swallowing and speaking. Weakness in the arms and/or legs, labored breathing, abdominal discomfort and distention, and constipation are other common symptoms.

Nausea, vomiting and diarrhea occur sometimes in botulism from seafood. However, many investigators think that such a gastrointestinal upset is secondary, probably caused by contaminants other than the botulinium toxin in the contaminated food.

## TREATMENT

Neutralizing substances called antitoxins are used to treat people who have been poisoned by the botulinum toxin. If the antitoxin is used early in the course of the disease, treatment is usually successful.

Full recovery is a slow process. People need an extensive rehabilitation program after the medical treatment. Depending on the severity of the illness, rehabilitation can take from 3 to 12 months.

## COMMERCIAL CONTROL OF BOTULISM

The canning industry has adopted standardized processes for sterilizing low-acid foods so that the probability of Clostridium botulinum spores surviving is very remote. An additional safety factor is provided by proper sanitary control, as specified in Food and Drug Administration's (FDA) Good Manufacturing Practice guidelines.

KEEPING FOODS SAFE

**If proper methods are <u>not</u> used for home canned foods**, some spores could survive, germinate, grow, and produce toxin. The resting spores themselves are not dangerous and many are probably eaten under normal circumstances. These spores cannot grow and produce toxin in the human intestinal tract and are eliminated intact from the body.

* Boiling home canned food before eating provides a reasonable margin of safety. All home-preserved foods canned without the use ofproper home canning methods should be boiled for 10 minutes shortly before they are served.

* Freezing will not destroy either toxin or spores but will prevent the germination and growth of spores. Keep frozen foods frozen until they are cooked.

* Never eat or even taste food from a swollen container or canned food that is foamy or has a bad odor.

* Use proper home food preservation techniques. Information is available from your County Extension Agent.

* When in doubt, throw it out.

QUESTIONS

1. Boiling home canned foods for ten minutes before serving will provide a reasonable margin of safety for preventing botulism.

   a. True
   b. False

2. The spores that cause botulism can survive at high temperatures for up to eleven hours.

   a. True
   b. False

3. Low-acid and moist foods encourage toxin production.

   a. True
   b. False

4. Freezing temperatures will not destroy the toxin and spores of the <u>Clostridium botulinum</u>.

   a. True
   b. False

5. Which of the following encourages the production of <u>Clostridium botulinum</u>?

   a. time
   b. lack of air
   c. water
   d. low acid foods
   e. all of the above

**WHAT IS AFLATOXIN?**

Aflatoxin is produced by a mold (Aspergillus flavus) called that grows on peanuts and grains. It is a natural poison first detected in 1960, when several flocks of commercially raised turkeys died from eating moldy peanut meal. Aflatoxin was identified as the poison that killed the turkeys. In later testing, aflatoxin caused liver cancer in laboratory animals. Scientist consider aflatoxin to be a potential human carcinogen (a carcinogen is a substance that could cause cancer).

Some of the foods that could contain aflatoxin are peanuts and peanut products and grains such as wheat and corn. If used to feed livestock, animals could absorb aflatoxin from the feed. Dairy products, such as cheese, milk, butter, and eggs, as well as meat and poultry products (beef, lamb, pork, turkey and chicken) could also contain aflatoxin.

**RISKS FROM AFLATOXIN**

You don't know of anyone who died from aflatoxin in peanuts or corn, right? This is because the amounts of aflatoxin in foods people eat are too small to cause poisoning, either because of government restrictions or because people shy away from moldy foods. Also there usually is a 10 to 40 year latency period after exposure to a carcinogen and before cancer symptoms appear. That makes it hard to trace a person's cancer back to a particular cause.

Another reason is that the cancer risk from aflatoxin is small, as shown below. So, even if a person's cancer could be linked to aflatoxin, it is unlikely that we would know of that person.

How risky is it to eat peanut butter? If peanut butter has an average aflatoxin level of 5 ppb (parts per billion) and people eat one peanut butter sandwich every 10 days, the lifetime risk might be about 17 extra cases of cancer per million people. If, over your lifetime, you eat more peanut butter than that, or if the peanut butter contains more aflatoxin, your risk would be higher.

**GOVERNMENT AND PRODUCER ACTIONS**

In 1969, the US Food and Drug Administration set an upper limit of 20 parts per billion (ppb) for aflatoxin in peanuts and peanut products. This 20 ppb limit was extended to corn as well as other grains in 1988. A much lower limit of 0.5 ppb was set for milk, also in 1988. The limit for milk that infants and small children drink is lower because of the large amounts of milk that they consume.

Many scientists judge that even small exposures to carcinogens can mean a small increase in the chance of getting cancer. So, there still could be some risk from consuming the upper limit allowed in peanuts, grains, or milk. Even the lowest level of aflatoxin currently detectable -about 0.4 ppb -could pose some hazard.

To minimize aflatoxin levels, growers follow a checklist of voluntary production practices. The Peanut Administration Committee, a private organization set up by producers, sets standards and monitors peanut and peanut products from producer to consumer. This includes inspecting nuts for mold growth and testing samples for aflatoxin. Some examples of testing aflatoxin are direct examination for the mold and using color sorters to detect for defects as well as aflatoxin. The Peanut Administration Committee has voluntarily set a 15 ppb limit for peanuts containing aflatoxin. Any peanuts with more aflatoxin are declared unfit for human consumption and discarded. Not all peanuts are inspected by the Peanut Administration Committee. Examples include peanuts still in the shell and the health store peanut butter that is made fresh.

## AFLATOXIN IN PEANUT PRODUCTS

Both the average level of aflatoxin and how widely it is found fluctuate from year to year, partly because of weather. The mold produces more aflatoxin in hot, dry weather. Most of the peanuts in the U.S. are grown on irrigated land and have little or no aflatoxin problem. A Consumer Reports' study has been checking the aflatoxin in peanut butter in three different years. In 1972, only 20 percent of samples contained as much as 2 to 3 ppb of aflatoxin. In 1978, aflatoxin was present in 88 percent of the samples and 4 percent of those exceeded the 20 ppb limit. In 1989, every sample contained detectable levels of aflatoxin, with an average of 5.7 ppb across the samples.

The 1989 study showed striking differences across brands. The big national brands (Jif, Skippy, Peter Pan, and Smucker's) all contained less than 1 ppb of aflatoxin. In contrast, there was at least 5 ppb in more than half of the store-brand and regional samples tested by Consumer Reports.

## AFLATOXIN IN CORN PRODUCTS

The presence of aflatoxin in corn, especially corn from the midwest, has caused concern about milk, cheese, and other products from dairy cows (which feed on corn) as well as foods made from cornmeal (corn chips, tacos, and breakfast cereals).

The abnormally hot dry weather in the summer of 1988 caused both larger concentrations and larger quantities of aflatoxin than in any other period since the detection of aflatoxin in 1960. The Food and Drug Administration (FDA) found that 6 percent of field corn in areas with known potential problems with aflatoxin (the hot, dry regions of the midwest) contained more than 20 ppb of aflatoxin, the limit set for grain intended for direct human consumption. (Keep in mind that field corn is used for livestock feed, not directly for human food.) In 1989's testing of finished ready-to-eat products like cereals and chips, FDA found no aflatoxin. About 2% of corn flour and cornmeal samples, however, were above the 20 ppb cutoff. Although FDA's policy is to remove such products from the market, the agency says that the amount of aflatoxin would be greatly reduced when the cornmeal or cornflour is cooked.

Corn-on-the-cob does not seem to be affected by the contamination problem. FDA recently tested fresh, canned and frozen sweet corn and found no aflatoxin. This is because sweet corn, including that sold at roadside stands, is harvested before the sugar in the kernels is converted into starch, on which the aflatoxin survives.

FDA permits corn with aflatoxin levels higher than 20 ppb to be used for nondairy animals, such as beef cattle and poultry. Studies have shown that such FDA-approved levels did not harm the animals and did not result in significant amounts of aflatoxin in meat or eggs.

**AFLATOXIN IN MILK**

Because of the 1988 drought, the FDA has notified state health officials to monitor milk for levels exceeding 0.5 ppb of aflatoxin. The states and the state-supported National Conference on Interstate Milk Shipments have been vigilant in enforcing this limit. In May, 1989, some milk tested in Texas, Minnesota, Iowa and southern Illinois had aflatoxin levels higher than the 0.5 ppb limit. The milk was dumped, so it did not reach consumers. That dumping also served as a reminder to farmers to seek assurances that the corn they buy for dairy cows is within safe limits. Farmers buy corn to feed cows and could end up with worthless milk. So, it is in their economic interest to make sure the aflatoxin levels in the feed are within the required limits.

Because of industry action and government regulation, the foods we eat have very low levels of aflatoxin.

**WHAT YOU CAN DO TO REDUCE THE RISKS FROM AFLATOXIN**

If you would like to reduce the risk from aflatoxin even more, there are some very simple procedures to follow.

* Buy a national brand of peanut butter. These brands have very low levels of aflatoxin compared to the local or no frills brands.(But even the local and no-frills brands were safer than the limits set for the FDA)

* Inspect unshelled peanuts before you buy or eat them. If the peanut looks moldy or discolored, discard it.

**QUESTIONS**

1. Aflatoxin is

   A. an insect that destroys grain crops
   B. an additive to preserve foods
   C. a natural poison and can cause cancer
   D. a new corn chip product

2. The <u>Consumer Report's</u> 1989 test of aflatoxin in peanut butter found

   A. no levels of aflatoxin in peanut butter
   B. 5 to 6 ppb average level of aflatoxin in peanut butter
   C. all samples had more aflatoxin than allowed by the government

3. Which of the following does not have aflatoxin?

   A. fresh corn-on-the-cob
   B. canned sweet corn
   C. frozen sweet corn
   D. all of the above are free from aflatoxin

4. How do you feel about your own long term risk from aflatoxin?

   A. very concerned
   B. somewhat concerned
   C. little concerned
   D. not concerned

5. How might reading these materials influence your food choices? Please circle the most likely outcome.

   A. Much more likely to buy a national brand of peanut butter
   B. Somewhat more likely to buy a national brand of peanut butter
   C. Somewhat less likely to buy a national brand of peanut butter
   D. Much less likely to buy a national brand of peanut butter
   E. No change in peanut butter purchases.

**GENERAL QUESTIONS**

1. Did you find these materials readable?

   A. Very difficult to understand.
   B. Difficult to understand.
   C. Somewhat difficult to understand.
   D. Easy to understand.
   E. Very easy to understand.

2. Do you judge these materials to be helpful?

   A. No new information.
   B. Some new information.
   C. Mostly new information.
   D. A great deal of new information.

## APPENDIX C - Summary of Follow-up Comments: Pilot Tests

### C.1 Informal Follow-up after New England Pretests

Six questions were used to structure the informal follow-up, immediately after respondents completed the paper or computer versions of materials about food risks from Salmonella, botulism, and aflatoxin. Time constraints meant that only twenty of the Cooperative Extension specialists and agents could be asked these follow-up questions. Their responses are summarized here. Some respondents did not answer every question.

1. What are your job responsibilities?

Eight identified themselves as home economists or as responsible for family development/nutrition education. Six reported dairy, livestock, or agronomy as their primary responsibility. Three are affiliated with 4-H or youth programs. Two are community development specialists. A few respondents had other primary responsibilities.

2. Who are your clients?

The largest group mentioned was other professionals (many attendees were university resource people for county agents). The next largest group was farmers, followed by homemakers and the general public. Other groups that were mentioned: 4-H, pregnant teens, parents, work site general public, teachers, consumer groups, community groups, community leaders, small business groups, home gardeners, and church groups. This list illustrates the diversity of Cooperative Extension client groups, some of which could require targeted information.

3a. If you were to use the computer version, what computer would you be using?

Eighteen are using IBM-compatible computers. Half of those have both graphics and color. Four do not have color, and six do not have graphics. Two are using Macintosh computers.

3b. What computers do your clients use?

Five reported that their clients use IBM-compatible machines, although some have limited graphics capability. Two reported clients using Macintosh or Apple computers. Three reported that their clients use various types, mostly older and not very sophisticated. Seven reported that their clients do not use computers.

4. How would your clients react to these materials in terms of style, and reading level? Would they find the content interesting or useful?

Many felt that this would be "tough reading for the average consumer," because the materials included too much and were too complicated and technical. It does help to be able to refer back to the earlier material. Some client groups have high illiteracy rates.

At least six thought the reading level was appropriate. One reported that the computer version was informative and easy to understand, and wanted to continue despite the small print on the small screen. A few thought Extension agents would read the materials, but that they were too long for producers to be willing to read. One liked the non-alarmist tone. One suggested including more tables, set up so that the reader can weigh risks with one glance.

A few respondents mentioned the problem of how agents would use the computer version with clients. They usually do not have access to meeting rooms equipped with computers, and seldom have opportunities for one-on-one interaction with clients in the Extension office where a computer would be available.

Several thought their clients would find the materials to be dry and boring. Salmonella and botulism are "old hat." Aflatoxin is more interesting because it is new, and because of the tie between peanut butter and children. The materials need to make personal interest clear, to keep the reader's attention beyond the third paragraph.

Adolescents would not find the materials sufficiently related to their lives, yet they make a lot of their own food purchases--especially those who are teenage parents.

One thought clients would respond to a brochure, but that no more than 20 percent of her clients would use a computer.

5. How effective would these be as part of a policy education program such as the food safety module of the Northeast Network?

Most though the materials would be helpful for the professionals conducting the program, but too heavy and time consuming for participants--although two said it would depend on how good the facilitator is. A few suggested that the materials should be mandatory for inspectors, cooks and others involved with handling food at 4-H livestock camps, or for courses in dairy management.

6. Would the materials be more useful if they said more about the risk assessment process and how food safety policy decisions are made?

Most thought their clients were more interested in the end result than in how the risks are assessed or the decision process.

A few others thought more risk assessment information would be useful, especially if examples were used and the materials were segmented into four pamphlets. The fourth one could include more on how risks are assessed. One said that policy education would require information on how risks are assessed. He thought the materials would be useful for responding to questions from the media and the public.

Suggestions:

Use color, graphics, and "bullets". The material must be appealing--perhaps a "between-you-and-me" story--rather than looking like an official document.

Break the material into smaller units (of about 4 pages). Present some material, then some questions, then more material and more questions. Make sure the information is practical--perhaps even mentioning brand names. The material should stand alone, rather than requiring someone to help the reader.

Repackage: a version that is transparencies or slides plus handouts. Other options: a computer game, with points for correct responses (to motivate learning); a video to set the tone and list questions to think about. Develop a background document and fact sheets for the facilitator.

Use the materials at shopping malls, fairs, in schools, science and computer museums, public libraries, and an electronic computer for kids.

C.2 Questions for Informal Follow-up

1. In the computer version, for questions using a numerical scale, would respondents rather choose a number (compared with moving the arrow keys)?

2. In the paper version, do we need an instruction (at least with Q2) to "circle the number that matches their response?"

3 a. Do the materials have too much detail? If so, what should we omit?

b. Should the materials have more detail? If so, what else do they want to know?

4 a. Who do they think <u>would be interested</u> in these materials?

b. Who do they think <u>should</u> see this information?

5 a. How likely is it that you would be able to use a computer version at home, or with a civic group or club?

b. What sort of computer are you most likely to have access to?

6. What is your overall reaction to these materials?

C.3 Summary of comments from Rose Society Pilot Test

Overall Comments

* Respondents wanted the materials to be quick, simple and easy to read.

* The respondents wanted to learn, but they don't have time to sit down and look at the questionnaire.

* The respondents wanted plenty of cartoons and a coupon on the front of the pamphlet.

* The respondents wanted the materials to be placed next to the product or, preferably, at the check-out counter.

* Generally, respondents liked the materials; however, they would not voluntarily - on their own time - obtain and read these materials. They would participate only through a meeting that required their attendance.

* For some people, the materials changed their opinion about eggs and Salmonella, for others it didn't

* Respondents clearly stated that they would NOT take time to read the materials if they were delivered by mail.

* If "Penn State University" was on the materials, they would at least consider looking at the materials.

* Respondents thought the questionnaire and the materials were too long and felt that both should be easier to read.

* Respondents did not like the scales.

* Most people liked the computer version, but due to their limited time, would prefer the printed material.

* A comment was made NOT to distribute the materials around holiday times.

* Other places for materials: on a magnet to stick on the refrigerator, or printed on egg cartons.

Who Benefits

* Responses varied. Some of them were: Everyone, kitchen help, cooks.

* Some respondents thought the materials should be targeted for use in schools and community groups rather than for individuals.

Questions

* Would eggs "over easy" kill Salmonella?

* How was Salmonella chosen?

* Why not other products besides eggs?

* Some respondents did NOT like the use of the calculation. They found it lengthy and hard to understand.

## C. 4 Summary of Lancaster Group

Many members wanted cartoon figures and pictures included in the materials and to shorten amount of information being conveyed.

Many participants found the material was to high level for their clients and needed to be toned down. Suggestions were made to target the materials to a lower level of reading comprehension.

Most participants recommended the use of a video about food safety for use in supermarkets.

Some participants who used the computer version thought it would do well as a tool in professional development for their colleagues.

Most participants agreed that a pamphlet version of the materials would be utilized by their clients if it were in a cartoon type format.

Many members thought the use of a pamphlet with a coupon that was distributed at the supermarket was a good ideal.

Participants that used the computer version, found it easy to use and wanted graphics included.

Very few respondents indicated that they changed their opinion about eggs and Salmonella.

The computer participants did not like the use of the scales.

All participants indicated that both their clients and themselves would benefit from the materials.

Many participants wanted other food-borne illness information other than Salmonella.

C. 5 Comments from Personal Interviews

The scales are confusing. Give a list or ranking by number.

Some felt the question concerning home fires and chemical production is inappropriate for ranking. They wanted to rank food borne illness within the comparison, not above or below it. Foodborne illness maybe a less serious problem than chemical production but more of a problem than fires.

The question concerning where contamination might occur (at the farm, the home, etc.) confused some respondents. They did not understand the process and where contamination might occur, so they could not rank the risks knowledgeably.

Most respondents would prefer labeling on the package rather than pamphlets or handouts.

Eight respondents were not familiar with the Cooperative Extension.

The question asking whether eggs with Salmonella smell bad provided some confusion. It should be clearer in the materials that eggs that smell bad should be disposed, even though these eggs might not contain Salmonella.

Some objected to the pairs of questions at the end of the module. They preferred no government involvement rather than choices between different types of government intervention in question 23.

Some respondents who were housewives thought the program was not too involved and reported that they learned about the topic.

Most comments pertained to the questions concerning the background of individuals and their knowledge rather than the presentation of the text. The questions about their background and knowledge led to different interpretations by different respondents.

# APPENDIX D: Pilot Materials

PENNSTATE

(814) 865-0469
FAX: (814) 865-3746

Department of Agricultural Economics
and Rural Sociology
College of Agricultural Sciences

The Pennsylvania State University
Weaver Building
University Park, PA 16802-5502

## EXPLANATION OF STUDY

Food safety issues (for example, Salmonella in eggs) often are in the news. This study is exploring the effectiveness of materials that describe how food risks are assessed and how such information can be used in food safety policy decisions.

We don't expect you to be an expert on this topic. The questions below ask how you feel about this topic--and how you feel about the way we ask our questions! For each question please choose the answer that best reflects **your** perceptions. Don't worry about giving wrong or unpopular answers. Your answers will be completely confidential. They will be combined with answers from other people for analysis, and nobody will be able to identify any one person's answers.

Why should you take part in this study?

FIRST, it will give you a glimpse of how researchers gather social science data.

SECOND, your responses will help us evaluate different ways to provide information about food safety.

THIRD, a summary of many people's perceptions can help policy makers as they weigh different actions to reduce the risks from food even more.

It takes about 20 minutes to read this material and answer the questions.

To find out more about this study contact:

Dr. Ann Fisher, Project Leader
Department of Agricultural Economics and Rural Sociology
The Pennsylvania State University
University Park, PA 16802
814-865-0469

**FOOD SAFETY: THESE MATERIALS HAVE BEEN DEVELOPED BY THE PENNSYLVANIA STATE UNIVERSITY AND USDA/EXTENSION SERVICE**

Sometimes, people get sick from the food they eat. This is called **FOOD-BORNE ILLNESS**. We can reduce food-borne illness by improving the safety of foods and how they are handled. The materials below describe some of what we know about the threats to food safety and how we can reduce the likelihood of food-borne illness.

First, please answer a few questions about food and food safety. Please choose the answer that reflects what you think: don't worry about agreeing with others or being right or wrong.

Q1. Over a two week period, how many eggs do you eat on average?

____________________

Q2. Food-borne illness is just one health and safety risk that people face. Compared with other risks such as car accidents, chemical production, home fires, and heart disease, how do you rate of food-borne illness?

Food-borne illness is:

| A much less serious problem | A somewhat less serious problem | About the same seriousness | A somewhat more serious problem | A much more serious problem |
|---|---|---|---|---|

|———|———|———|———|———|———|
1 2 3 4 5 6 7

Q3. Rate the job being done by federal government agencies (United State Department of Agriculture (USDA), U.S. Food and Drug Administration (FDA), and U.S. Environmental Protection Agency (EPA)) <u>to keep our food supply safe.</u> (Mark the box that matches your rating)

| | Very good | Good | Fair | Poor | Very Poor | Don't Know |
|---|---|---|---|---|---|---|
| FEDERAL GOVERNMENT AGENCIES | | | | | | |

Q4. Rate the job being done by the following groups to <u>inform the public about food safety issues:</u> (Mark the box that matches your rating)

| | Very Good | Good | Fair | Poor | Very Poor | Don't Know |
|---|---|---|---|---|---|---|
| STATE & LOCAL GOVERNMENT | | | | | | |
| COOPERATIVE EXTENSION AGENTS | | | | | | |

Q5. In the past three months, have you read or heard anything about food-borne illness (such as Salmonella, contaminated fish, bad vegetables)?

1. Yes. ->->-> If yes, where did you read or hear the information? (Put an X by all that apply)

   _____ 1. TV coverage of local news
   _____ 2. National TV program
   _____ 3. At work
   _____ 4. Local newspapers
   _____ 5. National newspaper
   _____ 6. Magazines
   _____ 7. Friends and family
   _____ 8. Other

2. No

Q6. On a scale of 1 to 7, how much do you feel that you know about food-borne illness?

| Nothing | | A little | | Some | | A lot |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Q7. Food-borne illness can come from different food groups. Rank the food groups using number 1 as the most likely to number 4 as the least likely in causing a food-borne illness:

____ Meat and fish

____ Breads and cereals

____ Fruits and vegetables

____ Milk and dairy products

Q8. Food-borne illness could be caused in various stages of food production, marketing, and use. What is the likelihood that food-borne illness is caused: (Check one column for each row.)

| | High | Medium | Low | Zero | Don't Know |
|---|---|---|---|---|---|
| At the farm | | | | | |
| At the processing plant | | | | | |
| During transport | | | | | |
| During storage | | | | | |
| In the store | | | | | |
| At home | | | | | |

Q9. Have you ever had food-borne illness?

1. Yes
2. No
3. Not sure

Q10. Has any friend or family member had food-borne illness?

1. Yes
2. No
3. Not sure

Q11. Do you regularly see or receive food safety information?

1. Often
2. Sometimes
3. Rarely or never

Q12. <u>Where</u> you would like to find food safety information? Please mark the number 1 by your first choice, and 2 by your second choice:

_____ Supermarkets
_____ Government buildings
_____ Shopping malls
_____ Libraries
_____ Telephone book number to call so information can be mailed to me
_____ Post office

Q13. How would you like to see food safety information presented? Mark 1 by the one your first choice, 2 by your second choice, and 3 by your third choice.

_____ On a computer
_____ A pamphlet
_____ Television program or public service announcement
_____ Newspaper
_____ Video tape
_____ Personal telephone call to expert
_____ Other_______________________________________

Thank you for answering these questions. We hope that the following information will help you make more informed choices about foods you prepare or eat, and understand the basics of food safety policies.

At the end are a few more questions that will:

* Reinforce what you read

* Help us evaluate these materials

-------------------------------------------------->>>>>>>>

## SALMONELLA: ONE SOURCE OF FOOD-BORNE ILLNESS

Food-borne illness has several possible causes. One cause is a family of bacteria called Salmonella. The bacteria can be found in the intestinal tracts of livestock, poultry, pets, and other animals. Rarely is it found in healthy humans.

Salmonella cannot be seen, smelled, or tasted, so it is difficult for the consumer to detect contaminated food. People can get sick from eating food that contains sufficient numbers of Salmonella. Sometimes, the bacteria are destroyed by acid in the stomach.

BACTERIA THAT MAKE IT PAST THE STOMACH CAN MULTIPLY IN THE INTESTINE.

6 to 48 hours after the food was eaten, there can be enough Salmonella in the small intestine to cause stomach pain. Other symptoms include nausea, vomiting, chills, diarrhea and fever. Most people recover without antibiotic treatment. Symptoms usually last from 3 to 5 days. Sometimes, the symptoms are severe enough to require hospitalization. The only accurate way to know whether a person's illness is from Salmonella is to test the stool (feces) in a laboratory.

Eggs have been linked to infections by a specific strain called Salmonella enteritidis. Both brown and white eggs occasionally have this strain of Salmonella inside the shell. A contaminated egg could cause a single case of illness if eaten by just one person. That egg could affect many people if it is used in improperly prepared or handled food eaten by a group. Fortunately, the heat from thorough cooking destroys Salmonella.

## HOW EGGS BECOME CONTAMINATED

During the 1960s and 1970s, Salmonella typhimurium was the predominant strain that caused illness from eggs. This came from sources contaminating the outer shell. In the early 1970s the federal government implemented programs for washing and sanitizing eggs. These programs dramatically reduced infection from Salmonella typhimurium.

Today, a different strain poses a risk of food-borne illness. This one, Salmonella enteritidis, has been linked to an infected hen laying a contaminated egg. The bacteria are located inside the egg shell, so disinfection and inspection cannot guarantee Salmonella-free eggs.

Infected hens can lay safe eggs for a long time. Then without any symptoms, the hen will lay contaminated eggs for a brief time. This short period will be followed by a long cycle of uncontaminated eggs.

Scientists have been investigating whether the Salmonella problem can be linked to the specific varieties of laying hens, to feed or feed ingredients, to breeder practices, or to management practices. So far, they have not been able to determine why some laying hens become infected with Salmonella enteritidis. The bacteria are more common in hens and eggs in the northeastern United States.

## HEALTH RISK

The risk of food-borne illness is highest in elderly persons, infants, pregnant women, and people with illnesses that impair their immune system's ability to fight infections. In these people, even a small number of Salmonella bacteria can cause illness. Illness from Salmonella can be more severe for these high-risk groups. Their infection can spread from the intestines to the bloodstream, and then to other parts of the body, such as the joints or the spinal cord. The infection can even cause death in these people unless promptly treated with antibiotics.

In general, the illness is more severe when more Salmonella bacteria are consumed. A small dose in a healthy individual might cause mild illness or no illness at all, although the bacteria can spend several weeks in the person's intestine before disappearing.

Infection with <u>Salmonella enteritidis</u> results from a failure in the chain of producing/processing/distributing/preparing/consuming of eggs. The likelihood of getting sick depends on the chance that eggs you eat are contaminated with the bacteria <u>AND</u> the chance that the eggs are handled and prepared in a way that allows the bacteria to survive and multiply.

This can be expressed as follows:

$$\text{Likelihood of Illness} = \text{Likelihood of using a contaminated egg.} \times \text{Likelihood of mishandling/undercooking an egg.}$$

The likelihood of illness will be zero if either (or both) of the terms on the right-hand side of this equation is zero.

A contaminated egg cannot cause illness if it is not mishandled or undercooked. Similarly, raw, undercooked, or mishandled eggs cannot cause illness if the eggs are not contaminated. Let's find out more about the chances that eggs are contaminated, and the chances that they are undercooked or mishandled.

**CHANCE OF A CONTAMINATED EGG**

**RAW EGGS**

Eggs are an excellent source of nutrients. But raw eggs are neither healthier nor of greater nutritional value than cooked eggs.

Estimates of contamination rates vary. As few as 1 in 100 average consumers could eat a contaminated egg each year, or as many as 1 in 2 average consumers could eat a contaminated egg each year.

**HOW DO EXPERTS KNOW HOW BIG THE RISK IS?**

A Penn State University study found that 1 in 10,000 eggs contained Salmonella enteritidis in infected hen houses. The U.S. Department of Agriculture conducted a random survey of hen houses in the Northeastern and Middle Atlantic states. They found that 45% tested positive for Salmonella enteritidis.

The average person in the United States eats 200 eggs a year. So with nearly 50% of all hen houses having Salmonella enteritidis, if these eggs were not pooled (e.g., cracked and put into a bowl for batter) in large numbers before being eaten, then 1 out of 100 average consumers could eat a contaminated egg each year. The number can be calculated this way:

$$\frac{\text{1 CONTAMINATED EGG}}{\text{10,000 EGGS LAID}} \times \frac{\text{1 INFECTED HEN HOUSE}}{\text{2 HEN HOUSES}} \times \frac{\text{200 EGGS PER YEAR}}{\text{1 PERSON}}$$

= 1/100 RISK OF EATING AN CONTAMINATED EGG

But the number could be much larger. Another study by T.J. Humphery found an egg contamination rate of 1 out of 200 from infected hen houses. Using the same type of risk calculation, this means a 1 in 2 chance of eating a contaminated egg. A study in Great Britain estimated a 1 in 10 chance each year of eating a contaminated egg. These studies leave experts with some uncertainty about how likely it is that an average consumer will get a contaminated egg. That's why a range was given above for this risk: contaminated eggs could be eaten by as few as 1 in 100 people or by as many as 1 in 2 people.

**REMEMBER, A CONTAMINATED EGG CANNOT MAKE THE PERSON SICK IF THAT EGG IS THOROUGHLY COOKED.**

There is always some risk from eating raw or undercooked foods of animal origin. But the average healthy person, even in the northeastern United States, is at low risk of Salmonella infection if he/she consumes individually prepared, properly cooked eggs that are eaten promptly or foods made from pasteurized eggs.

## PASTEURIZED EGGS

Eggs can be pasteurized just as milk is. Until recently, pasteurized eggs were not available for home use, except as low cholesterol egg substitutes made from pasteurized egg whites. Packages now are appearing in supermarkets for individual and family use. Pasteurized eggs need to be handled with care, like pasteurized milk. Commercially manufactured ice cream and egg nog are made with pasteurized eggs.

> **NO OUTBREAKS OF SALMONELLA HAVE BEEN ASSOCIATED WITH PASTEURIZED EGGS.**

## LIKELIHOOD OF MISHANDLING AND UNDERCOOKING AN EGG

### STORING EGGS

Bacteria multiply faster at warm temperatures. So, Salmonella outbreaks are highest during the summer months of June, July, and August.

Prompt and adequate refrigeration of whole eggs reduces the risk.

### EGG WHITES

It is possible for all parts of the egg --the white, the yolk and the shell-- to contain Salmonella. Most bacteria, including Salmonella, find it difficult to multiply in egg whites. Not only do egg whites have natural antibacterial substances, but they may lack nutrients needed for bacterial growth. However, when egg yolks and whites are mixed with other foods, bacteria from any source can multiply if not refrigerated right away.

### MISHANDLING

Bacteria on utensils, dishes and kitchen counter tops can spread and multiply in warm temperatures. Washing and rinsing utensils, dishes and surfaces with a mild detergent and hot water keeps Salmonella from spreading to other foods.

### COOKING EGGS

Individually prepared shell eggs that are eaten promptly after cooking are relatively safe even if the yolk is still soft. Eggs fried "over easy" probably are safer than eggs fried "sunny side up", because cooking on both sides is more likely to kill any bacteria. For persons at high risk, even a small number of bacteria could cause illness. For those people, eggs should be hard cooked, or pasteurized egg products should be used.

## ACTIONS TAKEN BY INDUSTRY AND GOVERNMENT.

The egg industry voluntarily uses quality assurance and sanitation measures. Some states require that eggs be refrigerated at each stage from the producer to the consumer.

The United States Department of Agriculture (USDA) has begun a mandatory program to test breeder flocks that produce egg-laying chickens shipped to other states, to be sure that they are free from Salmonella enteritidis. Also, the USDA traces back to egg laying flocks when there is a human outbreak of Salmonella enteritidis. Such a flock is tested and, if found positive, eggs from that flock are pasteurized rather than being sold as shell eggs.

The Food and Drug Administration (FDA) is preparing regulations for monitoring infection in laying hens, in case the USDA program is insufficient. The FDA already has issued guidelines or handling of eggs in food stores and restaurants.

## ACTIONS CONSUMERS CAN TAKE

* Keep eggs refrigerated.

* Promptly refrigerate leftover foods containing eggs.

* Wash hands before handling eggs and egg products.

* Avoid eating raw eggs. This includes foods made from traditional recipes for: mayonnaise, homemade ice cream, egg nog, salad dressings, and sauces. These will be safe if they are made from cooked custard, or from pasteurized eggs.

* Wash hands, utensils and surfaces after contact with eggs and egg products.

* Don't use cracked eggs.

* Eat eggs promptly after cooking. Don't hold them warm for more than 2 hours.

## SUMMARY

**Remember, eating eggs can be perfectly safe. Illness requires eating a contaminated egg that has been mishandled or undercooked.**

**Most healthy people will not get sick from eating a few Salmonella bacteria. Sensitive groups are more likely to get sick from a small number of bacteria.**

**Refrigeration keeps Salmonella from multiplying, washing utensils keeps them from spreading, and thorough cooking destroys them.**

**QUESTIONS**

Here are a few questions to reinforce what you just read and to help us evaluate the effectiveness of these materials:

Q14. A consumer can minimize the risk of Salmonella infection:

1. By keeping whole shell eggs refrigerated
2. By washing cooking utensils properly
3. By letting eggs "age" until the date stamped on the carton.
4. Only 1 and 2 above

Q15. The average chance of obtaining an egg that has been contaminated with Salmonella is:

1. 1 in 1
2. Between 1 in 2 and 1 in 100
3. 1 in 1000
4. Don't know

Q16. During what season would you expect the greatest incidence of Salmonella outbreaks?

1. Winter
2. Spring
3. Summer
4. Fall

Q17. Washing and disinfecting the outer shell of eggs will eliminate all Salmonella bacteria.

1. True
2. False

Q18. Cooking eggs until firm destroys any Salmonella bacteria in them.

1. True
2. False

Q19. An egg containing any <u>Salmonella enteritidis</u> bacteria always makes the person eating it get sick.

1. True
2. False

Q20. Eggs containing <u>Salmonella enteritidis</u> smell bad.

1. True
2. False

Q21. How likely do you think it is that you will get sick (sometime) from salmonella in eggs?

| Not at all | | Somewhat likely | | Fairly likely | | Almost certain to happen |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |

Q22. There are different ways to manage risk. **Think about these two options:**

Option 1. More inspections and more careful sanitation practices at poultry farms could reduce the chance that you (and other consumers, restaurants, bakers) would buy eggs containing Salmonella enteritidis. Suppose these actions would add 65 cents to the average price of a dozen of grade AA eggs (which now cost about $1.00), and would lower the risk of buying contaminated eggs by 50 percent.

Option 2. More careful sanitation practices at home (such as keeping eggs chilled and washing cooking utensils and counter tops to avoid cross-contamination) would reduce the chance of anyone becoming ill even if eggs do contain Salmonella. This requires more time and attention when using eggs, but egg prices would not go up. (You would still have the same risk when you eat eggs or egg products away from home.)

WHICH DO YOU PREFER, (Please circle) Option 1 OR Option 2 ?

Q23. Now think about these two options:

Option 3. Restaurants could be required to use only pasteurized eggs or eggs that have been cooked until they are firm. This would eliminate some menu items such as soft-boiled eggs, and fried eggs with soft centers. Recipes would have to be changed for other goods such as hollandaise sauce and some desserts that use raw or partially cooked eggs. There would not be a noticeable change in the price of restaurant meals using eggs.

Option 4. Food handlers could be required to have training more often to remind them about practices that prevent Salmonella from spreading and multiplying. This extra training would increase labor costs. These costs would be passed along to customers: prices of menu items using eggs would be 25 percent higher.

WHICH DO YOU PREFER, (Please circle) Option 3 OR Option 4 ?

Q24. How easy / hard was it to understand this information about food safety?

| Very difficult to understand | Somewhat difficult to understand | Easy to understand | Very easy to understand |
|---|---|---|---|

|___|___|___|___|___|___|
1 2 3 4 5 6 7

Q25. Do you judge this information about food safety to be helpful?

| No new information | Some new information | Mostly new information | A great deal of new information |
|---|---|---|---|

|___|___|___|___|___|___|
1 2 3 4 5 6 7

Q26. How has this information affected your confidence that you can CHOOSE OR PREPARE SAFE FOOD?

Much more confident — Much less confident

1 — 2 — 3 — 4 — 5 — 6 — 7

Q27. How has this information affected your confidence about ACTIONS TAKEN BY THE GOVERNMENT to keep foods safe?

Much more confident — Much less confident

1 — 2 — 3 — 4 — 5 — 6 — 7

Q28. How has this information affected your confidence about ACTIONS TAKEN BY THE FOOD INDUSTRY to keep foods safe?

Much more confident — Much less confident

1 — 2 — 3 — 4 — 5 — 6 — 7

To help us understand your responses and develop better materials, please answer the following questions:

Q29. What is your sex?

1. Male
2. Female

Q30. Do you prepare the majority of meals for yourself and/or family?

1. Yes
2. No

Q31. How would you classify where you live?

1. Farm
2. Rural non-farm (away from town, in the countryside)
3. Suburban (neighborhoods, trailer parks, close to town)
4. Urban (city, in-town)

Q32. How many people live in your household?

____________

Q33. Do you buy the most of the food for yourself and/or your family?

1. Yes
2. No

Q34. What is your age category?

1. Under 20
2. 20-29
3. 30-39
4. 40-49
5. 50-59
6. 60-69
7. 70 or over

Q35. What is the highest level of EDUCATION that you have completed?

1. Some high school or less
2. High school diploma
3. Some college
4. College diploma
5. Some graduate school
6. Graduate degree

Thank You for your time and participation.