An Evaluation of Dairy Producer Emergency Preparedness and Farm Security Education

D. A. Moore^{*1} and M. Payne[†]

^{*}Veterinary Medicine Extension, University of California, Davis 95616

[†]Western Institute for Food Safety and Security, Davis, CA 95616

ABSTRACT

Dairy producer education on securing the milk and meat supply is important to reduce the food system's vulnerability to contamination, and reduce the likelihood for disease transmission onto and within the farm. The purpose of this project was to develop and test a producer-audience curriculum on emergency preparedness and biosecurity awareness. Forty-three attendees from 3 organizations responded to pre- and posttests and a course evaluation. After the program, most of the participants found the program relevant (95%), that it provided practical solutions to biosecurity (97%), were very likely to assess their farms for biosecurity and security (70%), and would suggest the program to other producers (98%). Participants who strongly agreed that the program was relevant and provided practical solutions to biosecurity were very likely to assess their farms. Awareness and knowledge are the first steps toward changing attitudes and behavior and can be accomplished with directed, relevant, practical educational programs.

Key words: education, biosecurity, dairy, extension

INTRODUCTION

In the *Agroterrorism Prevention Act of 2005*, Congress noted that United States agriculture and food systems are vulnerable to biological agents that may be used in acts of terrorism, that the food system is extensive and open, that there is a large potential economic impact of such an act, and that important risk factors include the lack of overall security and the lack of biosecurity (United States Congress, 2006). Implementation of management practices that enhance farm biosecurity was concluded to be important in preventing the intentional introduction and spread of a disease affecting agriculture.

Because of the potential vulnerabilities of dairy farms and the milk supply and the economic impact that introduction of a biological or chemical agent might have, numerous activities in research and extension education have been devoted to farm biosecurity and security efforts across the country. Several regional surveys have identified the attitudes and practices of dairy producers about biosecurity and farm security. In Wisconsin, Hoe and Ruegg (2006) found that less than half of the respondents to a producer survey actually tested their purchased cattle for diseases and less than half inquired about the herd of origin with regards to disease. Only about 20% of Idaho producers with herds undergoing expansion required any testing of purchased cattle for diseases other than mastitis (Dalton et al., 2005) and only about one-half of producers with expansion herds in the upper Midwest required any health testing (Faust et al., 2001). A recent survey of dairy producers in the intermountain states revealed that less than one-fourth of the respondents had a security policy in place, many agreed that a stranger could go unnoticed on the farm and gain access to the bulk milk tank room or feed, and less than half thought that security measures would be important on their farms (Buttars et al., 2006). Producers responding to this survey were likely to have invested in security measures if they were aware of how to develop a security policy and had a good idea of the cost of security measures. In a California study (E. Shilegdamba, D. A. Moore, M. L. Truscott, and J. Gillespie; Univ. California–Davis; unpublished data), only about half of the respondents were concerned about issues of agroterrorism because they had more immediate needs to attend to. Although a number of security measures were thought to be effective, such as locking the bulk tank room, employee training, surveillance cameras, and traffic flow, most producers were not very likely to use any of these measures, except employee training. Most dairy managers did not think that agroterrorism was a legitimate threat to their farm. Those that had already invested in farm security measures had most likely done so because of the potential for theft.

Received August 29, 2006.

Accepted November 13, 2006.

¹Corresponding author: damoore@ucdavis.edu

It is clear from these reports on farm security that motivation for producers to engage in securing their farms will require education about the real risks of agroterrorism and security measures that work and are cost-effective. Additional motivation for improving farm security might come from an “all-hazards” approach to security and biosecurity; that is, knowledge that links farm security and biosecurity measures with everyday activities and more common problems experienced on the farm. The “all-hazards” approach is the current federal thinking with regards to homeland security. The National Response Plan to emergencies and disasters “establishes a comprehensive all-hazards approach to enhance the ability of the United States to manage domestic incidents” (US Department of Homeland Security, 2006). This approach is used to train first-responders and government agency personnel to react appropriately and comprehensively to any large-scale crisis (US Government Accountability Office, 2005). A similar approach could be used at the farm-level to educate producers about all the potential hazards, such as emergency planning for disasters as well as foreign and domestic disease introduction and transmission on the farm.

The California Department of Food and Agriculture, the University of California, School of Veterinary Medicine, the dairy industry, and the California Dairy Quality Assurance Program developed and tested an educational program for dairy producers on emergency preparedness and biosecurity. The purpose of this article is to discuss the curriculum and provide results of the course evaluation that examined changes in attitudes and knowledge.

MATERIALS AND METHODS

The emergency preparedness and biosecurity course for dairy producers consisted of an “Introduction to Agroterrorism” slide set, a video covering on-farm emergency preparedness, a video on practical on-farm biosecurity measures, structured discussions with producers between each of the segments, and a generic checklist for on-farm biosecurity (Appendix A). Although a major theme of the program was to increase awareness of foreign animal disease (**FAD**) introduction and agroterrorism, the materials covered “all hazards” including floods and other natural disasters, contamination of feed and milk, and introduction of infectious disease (endemic and foreign).

The educational program was first provided to dairy farm advisors in cooperative extension for their review and comment and then to dairy industry leaders for comment. The final program was then delivered to 43 individuals in 3 locations, in conjunction with annual

meetings of 2 farm organizations and by invitation at another site, to test the messages, assess changes in awareness, assess knowledge retention on some of the main points, and solicit comments about the usefulness of the educational program. The attendees were self-selected. The program took about 1.5 h to complete, including all discussions. Each person was provided a “pretest” that covered attitudes and knowledge regarding biosecurity, a “posttest”, and a structured course evaluation. Response data were entered into a computerized spreadsheet and analyzed using χ^2 contingency table analysis.

RESULTS

The presenters found most producers well engaged during discussions at the end of each educational segment. Although the set of discussion questions was scripted, producers provided additional comments, generated discussion among themselves, and asked important questions about the issues raised during the program.

Pre- and Posttest Results

Many course participants changed their attitudes about farm security and agroterrorism after participating in the course (Figure 1). Participants were 1.5 times more likely to *agree* or *strongly agree* that implementing farm security measures would help reduce risks for FAD after completing the course compared with before ($P < 0.0001$). Although most participants (92%) either *agreed* or *strongly agreed* that implementing farm security measures would help reduce the risk for “domestic” diseases, such as *Salmonella*, Johnne’s disease, and bovine viral diarrhea, 60% more individuals *strongly agreed* with this statement after participation in the course ($P = 0.004$). After the course, all agreed that foreign terrorists were considering livestock as potential targets; participants were over 2 times more likely to *strongly agree* with this statement after the course ($P < 0.0001$). When asked about their belief that domestic terrorists were a potential threat to their operation, 100% *agreed* or *strongly agreed* with this statement after the program, compared with 87% before the program began ($P = 0.05$); respondents were 2.6 times more likely to *strongly agree* after the course compared with before ($P < 0.0001$).

Six knowledge questions were asked covering important points raised in the program. There was a trend for more correct answers after the course to the question on the potential economic consequences of a foot-and-mouth disease (**FMD**) outbreak in their county and in the state, on their ability to ship milk,

Figure 1. Frequency of responses to pre- and posttests on attitudes and knowledge about agroterrorism and biosecurity. *Indicates a significant difference ($P < 0.05$) between the proportion responding *strongly agree* before and after an educational program.

and on national trade (57 vs. 66% correct; $P = 0.09$). Virtually everyone knew the signs of FMD before and after the program (94 vs. 95% correct). However, there was a significant improvement in the proportion of correct responses to a question on the economic impact of a delay in reporting of FMD (45 vs. 84% correct; $P = 0.0005$). There was no improvement in knowledge about what actions the government would take in the face of a potential FMD outbreak, nor in the potential sources of disease (97% correct at each time point). There was marked improvement in correct responses to the question on standard on-farm quarantine times for new arrivals (29 vs. 72% correct; $P = 0.0001$).

Course Evaluation

Each participant was asked to complete a course evaluation in addition to the pre- and posttests. A summary of their responses is provided in Table 1. Because of the potential for milk or meat contamination, we asked the producers if they agreed with the statement "As a dairy producer, I am in the food business" and all but 2 *strongly agreed*. Thirty-three of the 43 respondents *strongly agreed* that the subject matter of the course was relevant to their dairy operation and all but one *agreed* that they would suggest this course to others, and that the program provided them some

practical solutions to on-farm biosecurity risks. Fifty-one percent *strongly agreed* that they would make at least one change in their operation concerning farm security or biosecurity and over 67% *strongly agreed* with the statement that the subject matter enhanced their knowledge about FAD introduction.

Those participants who *strongly agreed* that the subject matter was relevant to them were over 6 times more likely to *strongly agree* that they would make at least one change in farm security ($P = 0.004$), tended to *strongly agree* that the program enhanced their knowledge about FAD ($P = 0.08$), were 3.5 times more likely to *strongly agree* that the program provided practical solutions to on-farm biosecurity ($P = 0.01$), and were 2.5 times more likely to *strongly agree* that they would suggest the program to other producers ($P = 0.007$) and discuss what they learned with trusted employees ($P = 0.03$).

Motivating producers to assess their farm for security and biosecurity risks was the ultimate goal of the educational program. When we asked producers how likely they were to assess their farm for security and biosecurity risks, how likely they were to discuss what they had learned with employees, and how likely they were to post state emergency phone numbers, most indicated that they were *very likely* to do those things. To understand producer motivation better, we exam-

Table 1. Results of participant evaluation of a dairy producer course on emergency preparedness and biosecurity

Statement or question	Response	Frequency	%
I believe the subject matter is relevant to my operation.	Strongly agree	33	76.8
	Agree	8	18.6
	Disagree	1	2.3
	Strongly disagree	1	2.3
I will be making at least one change with regard to farm security or biosecurity.	Strongly agree	22	51.2
	Agree	18	41.9
	Disagree	2	4.6
	Strongly disagree	1	2.3
The subject matter enhanced my knowledge about foreign animal diseases.	Strongly agree	29	67.4
	Agree	14	32.6
	Disagree	0	0
	Strongly disagree	0	0
As a dairy producer, I am in the food business.	Strongly agree	41	95.4
	Agree	2	4.6
	Disagree	0	0
	Strongly disagree	0	0
The program provided practical solutions to on-farm biosecurity.	Strongly agree	25	58.2
	Agree	17	39.5
	Disagree	1	2.3
	Strongly disagree	0	0
The use of different media presented the subject matter effectively.	Strongly agree	31	72.1
	Agree	12	27.9
	Disagree	0	0
	Strongly disagree	0	0
I would suggest this course to other dairy producers.	Strongly agree	31	73.8
	Agree	10	23.8
	Disagree	0	0
	Strongly disagree	1	2.4
How likely are you to assess your farm for security and biosecurity risks?	Not very likely	2	4.6
	Somewhat likely	11	25.6
	Very likely	30	69.8
How likely are you to discuss what you have learned with trusted employees?	Not very likely	2	4.8
	Somewhat likely	13	30.9
	Very likely	27	64.3
How likely are you to post state emergency numbers?	Not very likely	4	9.5
	Somewhat likely	12	28.6
	Very likely	26	61.9

ined possible associations between responses to what they gained from the course and if they were *very likely* to assess their farm. Twice as many participants who *strongly agreed* that the topics were relevant to their dairy, that they would make at least one change, and thought that the program provided practical solutions were *very likely* to assess their farms compared with those who did not *strongly agree* ($P = 0.05$; $P = 0.006$; and $P = 0.006$, respectively). In addition, almost twice as many participants who *strongly agreed* that the use of the different media components presented the subject matter clearly were *very likely* to assess their farms ($P = 0.03$). Written comments on the course evaluation could be generalized into 3 major themes: an appreciation for the practical and farm-oriented nature of the presentations, a new awareness of the risks, and an interest in having the materials available to all dairy producers.

DISCUSSION

Adult educational programs such as this one can be used to increase awareness, improve knowledge, develop skills, and eventually alter behavior. With a short-term educational intervention such as this lecture and discussion format program, educators can increase awareness of an issue and also change knowledge. To have program participants anticipate and commit to making a behavior change, such as indicating their likelihood of assessing their farms for biosecurity, is the next step to change behavior (Mazmanian and Mazmanian, 1999).

Although many producers knew the answers to the knowledge questions before the course, important changes were the attitudes of producers about the usefulness of farm security measures to reduce foreign and domestic diseases, and the awareness of the poten-

tial threat of agroterrorism. In a model of learning and behavior change, the first stage of learning is the recognition or awareness that the problem is one the individual might encounter or is a problem for them (Prochaska et al., 1992; Parker and Parikh, 2001). The next stages include preparing to make a change (i.e., learning what it takes), then taking action, and, finally, fine-tuning the behavior change (Prochaska et al., 1992). Our educational program was designed to improve awareness. The fact that producers indicated a likelihood of actually assessing their farms with the generic biosecurity checklist provided to them demonstrates a movement into the stage of preparation before taking action.

The educational program characteristics associated with producers' willingness to assess their dairy operations included their belief in the relevance of the program and that the program provided practical solutions to them. In addition, appreciation for the different media components of the program was associated with a likelihood of farm assessment for security and biosecurity. After this awareness education is provided to producers across the state, the next step is a follow-up program that will provide a more detailed on-farm assessment tool for biosecurity and farm security that producers can use with their advisors. Fine-tuning and maintenance of a behavior change can be enhanced by such follow-up activities (Green and Kreuter, 1991). Those individuals who responded with *somewhat likely* to make a change or do something differently on the farm were probably still in the contemplation stage of behavior change and not yet sure if the problem was relevant to them or that they had control over the solution.

Although the majority of attendees found the program useful, there were a few individuals who disagreed with some of the statements on the course evaluation and were unlikely to make any changes to their farms. The 2 respondents disagreeing with the statement that the subject matter was relevant to their operations were not likely to make any changes and not likely to post the state agriculture department emergency numbers (one also disagreed with the statement that the program provided practical solutions to on-farm biosecurity and the statement about recommending the program to other producers). If an educational program is not considered relevant to an individual (i.e., not a problem for them), they will not need to learn the information and they will not make a behavioral change. If the example dairy farm (a 1,000-cow Holstein herd) in the videos was very different from their own farm, they may not see value in the information. For the 2 individuals who were not going to make at least one change in their operations, al-

though they saw some relevance to the materials, they were not yet at the stage of changing behavior or they had already made the changes to their farms. For future work in identifying the potential for behavior change, existing security and biosecurity measures on the farm could be assessed first for appropriate baseline comparisons.

CONCLUSIONS

In conclusion, educational efforts that can change attitudes about the perceived threats to a farm and can provide relevant, practical information about what a producer can do are the first step to ensure the safety and security of our food supply. Based on the responses to our course evaluation, we expect to see many of the producers making changes in biosecurity or security to their farms.

ACKNOWLEDGMENTS

The authors are grateful to the faculty of the University of California, Davis, and the California Department of Food and Agriculture veterinarians who helped script the videos and develop or review the curriculum; to the farm advisors and extension faculty who reviewed the materials; to the California Department of Food and Agriculture, US Department of Agriculture, and the Dairy Quality Assurance Program for funding; to the Western Institute for Food Safety and Security for some media components; and to M. Truscott for data management.

REFERENCES

- Buttars, N. K., A. J. Young, and D. Bailey. 2006. Adoption of security measures by dairy farms to address bioterrorist threats in the Intermountain United States. *J. Dairy Sci.* 89:1822–1829.
- Dalton, J., R. Norell, and M. Chahine. 2005. Biosecurity practices used during dairy herd expansion. *J. Dairy Sci.* 88(Suppl. 1):300–301. (Abstr.)
- Faust, M. A., M. L. Kinsel, and M. A. Kirkpatrick. 2001. Characterizing biosecurity, health, and culling during dairy herd expansions. *J. Dairy Sci.* 84:955–965.
- Green, L. W., and M. W. Kreuter. 1991. *Health promotion planning: An education and environmental approach*. Mayfield Publishing Co., Mountain View, CA.
- Hoe, F., and P. L. Ruegg. 2006. Opinions and practices of Wisconsin dairy producers about biosecurity and animal well-being. *J. Dairy Sci.* 89:2297–2308.
- Mazmanian, P. E., and P. M. Mazmanian. 1999. Commitment to change: Theoretical foundations, methods, and outcomes. *J. Contin. Educ. Health Prof.* 19:200–207.
- Parker, K., and S. V. Parikh. 2001. Applying Prochaska's model of change to needs assessment, programme planning and outcome measurement. *J. Eval. Clin. Pract.* 7:365–371.
- Prochaska, J., C. DiClemente, and J. Norcross. 1992. In search of how people change: Applications to addictive behaviors. *Am. Psychol.* 47:1102–1114.
- United States Congress. 2006. Senate. 109th Cong., 2d sess. S.1532: *Agroterrorism Prevention Act of 2005*. Online: <http://www.>

govtrack.us/congress/bill.xpd?bill=s109-1532 Accessed Aug. 8, 2006.

US Department of Homeland Security. 2006. National Response Plan. http://www.dhs.gov/xprepresp/committees/editorial_0566.shtm Accessed Aug. 3, 2006.

US Government Accountability Office. 2005. DHS' efforts to enhance first-responders all-hazards capabilities continue to evolve. GAO-05-652, 1-64. <http://www.gao.gov/docsearch/featured/dpr.html#Preparedness> Accessed Aug. 3, 2006.

APPENDIX A

CA DQA Emergency Preparedness and Food Security Educational Program

Title: Emergency Preparedness and Food Security—Module 1

Sponsors: CA DQA-CMAB, U.C. Davis Cooperative Extension, U.C. Davis School of Veterinary Medicine, CDFA, WIFSS and the National Center for Foreign Animal and Zoonotic Disease Defense

Objectives:

1. Raise producer awareness about the potential threat for a foreign animal disease (FAD), like foot and mouth disease, and the potential contamination of the milk supply.
2. Have producers able to list five consequences of a disaster, such as an FAD, toxin contamination, or natural disaster.
3. Provide a tool and instructions on the use of a tool to assess the farm's security and biosecurity.
4. Provide recommendations to assist in producers' preparation for emergencies such as an FMD outbreak.

Curriculum outline:

1. **Welcome and Pretest** (10 min)
 2. **Introduction to Agroterrorism—PowerPoint presentation** (10 min)
 3. **Discussion** (10 min)
How do you feel about what you just saw?
What do you think the producer's role is in a livestock emergency or disaster?
 4. **Emergency Preparedness—Video** (12 min)
 5. **Discussion** (10 min)
What do you think are the most important consequences of livestock emergencies?
What do you think producers can reasonably prepare for?
What can they reasonably do to prevent disease transmission?
 6. **On-farm Biosecurity—Video** (12 min)
 7. **Discussion** and introduction to examples of farm security measures (10 min)
 8. **Security/Biosecurity Checklist—Assessing your own farm's vulnerability** (a generic checklist to increase awareness of the risk of disease/toxin introduction).
Discussion of the on-farm risk assessment tool (module 2). (20 min)
 9. **Posttest and Course Evaluation** (10 min)
- Total estimated time: 104 min