Public Veterinary Medicine:
Food Safety

Continuing education needs assessment
for on-farm food safety services

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Objective—To identify the perceived market or client demand for dairy on-farm food safety services by veterinarians, the need for a food safety continuing education program, and the educational issues that might be addressed in an on-farm food safety curriculum.

Design—Survey.

Study Population—Consulting dairy veterinarians, government veterinarians located in California, and meat packers slaughtering cull dairy cows in California.

Procedure—Results of a questionnaire supplied to veterinarians and telephone interviews with meat packer representatives were analyzed by use of univariate and multivariate logistic regression procedures.

Results—Some meat packers considered the quality of incoming cull dairy cattle as a control point for food safety hazards. More than 50% of dairy and government-employed veterinarians believed that a current market for on-farm food safety services exists; > 85% believed that a potential market exists. Duration since graduation was negatively correlated with belief in a current market. Government-employed veterinarians were more likely to believe in a current market. Veterinarians were more likely to express a strong interest in offering on-farm food safety services if they believed a current market exists, indicated that they already offer such services, or listed residues and pathogens as the most important issues facing the dairy industry.

Conclusions and Clinical Relevance—Although a potential market for on-farm food safety services is perceived, veterinarians are unsure of their role in this area. New demands of meat packers slaughtering cull dairy cows may be the motivation practitioners need to broach the subject of food safety with clients. (J Am Vet Med Assoc 2000;217:479–484)

During the last 20 years, on-farm food safety issues have been discussed by food animal practitioners. Issues include public health concern for antimicrobial residues in meat and milk, contamination of meat and milk by Escherichia coli and Listeria, Campylobacter, and Salmonella spp, and the possibility of transfer of resistance to human pathogens as a result of antimicrobial use in food animals. Food animal veterinarians often find themselves in the middle of these issues, because they are livestock producers' primary resource for disease control, treatment, and information for making management decisions. Veterinarians are, or should be, integral in the development of management decisions about on-farm food safety.

Hazard Analysis Critical Control Point (HACCP) processes for the control or reduction of food safety risks were first implemented in food processing and are now being implemented in slaughter plants. All meat packing and slaughter establishments were required to have HACCP plans in place by January, 2000. Yet to be developed on a broad scale are the processes and control measures for food safety risks originating on-farm. For dairy herds, techniques including HACCP plans, total quality management, continuous quality improvement, and quality assurance have been suggested to reduce antimicrobial residue risks. Veterinarians are in a key role to help develop science-based systems that meet the requirements of the USDA: Food Safety and Inspection Service (USDA: FSIS) to prevent chemical, physical, and biological hazards in animal products. However, veterinarians will likely require continuing education to prepare them to provide food safety services to their dairy clients.

Before an effective educational program can be designed, a needs assessment is necessary to determine the market for the program and the educational components that potential participants may want or need. Needs assessment methods in continuing education include focus group discussions for qualitatively identifying learner needs or wants, conducting environmental scans for topics of importance to a group or profession through literature reviews or interviews with experts, or gathering ideas from surveys.

Surveys may provide qualitative and quantitative assessments of learner-identified needs and wants. The purposes of the survey reported here were to identify dairy veterinarians' perception of the market or...
client demand for dairy on-farm food safety services, identify the need for a food safety continuing education program, and elucidate the important educational issues that need to be addressed in the curriculum. Because meat packer requirements can impact the kinds of on-farm food safety services offered to dairy clients, another objective was to identify issues important to slaughter establishments for cull dairy cow food safety.

**Materials and Methods**

Survey—All 9 meat packers that slaughter cull dairy cows in California were contacted to participate in a telephone interview about their concerns and requirements for incoming cull cows when working under a HACCP plan. The packer survey consisted of a section describing the purpose of the study and the importance of their cooperation, questions on HACCP plans in their plants, a section in which packers could describe what dairy producers should know to assure cull cow quality, and a section in which packers could describe their preferences for characteristics of incoming cattle. Each interview lasted approximately 15 minutes, and all interviews were conducted by the same interviewer.

Dairy veterinarians were assessed for continuing education needs by use of a written questionnaire. A list of dairy veterinarians (primarily from western states) with interest in dairy consulting practice was compiled from the Academy of Dairy Veterinary Consultants membership roster. Names of veterinarians known to be working in dairy herd health and production medicine in the western United States were added to the list. A written survey was provided to all veterinarians on the list. The survey required at least 15 minutes to complete and included multiple choice questions and open-ended questions to obtain a range of possible responses.

The dairy veterinarian survey was divided into 3 parts. The first section included questions on client demand and the market for on-farm food safety veterinary services. The second section included questions about educational interests and needs in the area of food safety and production medicine. The last section included questions that characterized the respondent with regard to practice type, time in practice, and amount of practice devoted to dairy work. The questionnaire was tested with a group of 5 dairy practitioners and revised before use.

Government-employed veterinarians in California were assessed for ideas about market demands for on-farm food safety services and learner needs for a food safety educational program. The government veterinarian questionnaire was reviewed and tested by 2 government veterinarians. The survey was mailed to 40 government (state and federal)-employed veterinarians working in California, identified by the California Department of Food and Agriculture. The cover letter highlighting the importance of participation with this survey originated from the California Department of Food and Agriculture.

Statistical analyses—Responses to open-ended questions were evaluated and coded for similar themes. All data were entered into a computerized database program, summarized, and analyzed by use of commercially available software. Respondent comments were qualitatively analyzed for prevailing themes and range of responses. Logistic regression analysis was used to assess possible predictors for belief that a current market exists for food safety services, belief that a potential market exists, and respondents’ interest in offering on-farm food safety services to dairy clients.

**Results**

Packer survey—Seven of 9 meat packers that slaughter cull dairy cattle agreed to be interviewed by phone to identify their concerns regarding meeting HACCP requirements and to understand their requirements for incoming cull dairy cattle. All but 1 plant was operating with HACCP plans, and none had specific criteria for incoming cattle in their HACCP plans. One plant was considering not accepting cattle from suppliers who had violative residue histories. Packers provided topic ideas to include in dairy producer training including residue avoidance and proper use of antimicrobials, avoidance of shipping cattle with known health problems, proper handling of cattle to reduce bruising, use of treatment records, reduction of injection-site lesions, quicker culling decisions, and ways to improve cow cleanliness.

Physical damage that packers thought likely to affect incoming cattle included bruising (n = 3), injection site lesions (1), and none of any importance (3). To reduce bruising, packers suggested better cattle handling, corrals maintenance, and that attention should be paid to stock trailer safety. Packers mentioned *Escherichia coli* O157:H7 and *Salmonella* spp as the primary biological hazards and suggested that producers and cattle dealers reduce overcrowding in pens, make quicker culling decisions, keep cleaner trailers, and maintain corral cleanliness. Chemical hazards included antimicrobial residues and residues from pesticides or chemicals in feed. Packers suggested that treatment protocols, treatment records, attention to withdrawal times, and better cattle identification would help reduce chemical hazards.

Packers were asked to score specific preharvest quality factors from not a priority to high priority. Opinions on the importance of reducing injection site lesions varied from low priority to high priority. Reducing the number of dirty cattle, reducing antimicrobial residues, and improving body condition and health of incoming cattle were all of medium to high priority for packers. Responses for obtaining treatment documentation or health history, use of a traceable identification system, and obtaining farm food safety history were mixed and ranged from no priority to high priority.

Half the packers had already requested changes in cattle transport practices by looking for cleaner trucks, cleaner cattle, and low transit times. Most packers would like to have written guarantees that cattle do not contain residues. Two packers speculated that they would price cattle higher if they were sure of cattle origin and that the ranch of origin had a good history with respect to food safety.

Veterinarian survey—Of 120 surveys, 79 (66%) were returned; 53 of 80 (66%) surveys were returned by practitioners and 26 of 40 (65%) by government veterinarians. Eighty-four percent of the dairy veterinarians were actively engaged in dairy practice, 10% were employed by industry, 2 were dairy herd owners, and 1 was a new government employee. Approximately 75% of the dairy veterinarians devoted > 90% of their practice to dairy work, and 50% practiced exclusively on dairy cattle. Two-thirds of the practitioners worked primarily in California. Twelve other states were represented as the primary practice location: Alabama, California, Colorado, Idaho, Illinois, Indiana, Iowa, Kentucky, New York, North Carolina, Ohio, and Texas.

All but 2 of the California-based government-employed veterinarians were state-employed. One was involved in > 90% dairy-related work, and all others worked with at least 1 other animal commodity including poultry, beef, small ruminant, equine, or swine. One had no food animal practice experience before government employment, 19.2% had < 3 years of experience, and 77% had ≥ 3 years of food animal practice experience.

The percentage of responses from each employment group for specific questions in the survey was tabulated (Table 1). Mean years since graduation was greater for government-employed veterinarians (27 years) than practicing veterinarians (16 years; P < 0.001), and government-employed veterinarians worked less with dairy cattle than practicing veterinarians. More than half of all respondents believed there was a current market for on-farm food safety services for dairy clients. Most believed there was a potential market for these services. More than a third of all respondents indicated that nonveterinarians should offer on-farm food safety services. Practitioners felt that regulatory personnel should offer these services (14/23 responses). Government-employed veterinarians believed that regulatory personnel should offer these services (14/23 responses). Two-thirds of respondents reported they were already offering on-farm food safety services; however, most (85.3%) practitioners reported these services were integrated into other work they do on the farm such as development of treatment protocols and mastitis control programs.

There was a wide range of responses regarding the most important food safety issues facing dairy producers. Residues were most commonly mentioned by practicing veterinarians, whereas government veterinarians most commonly listed pathogens. Practitioners believed that the 2 most important opportunities for veterinarians to be involved in on-farm food safety were developing treatment protocols and promoting residue avoidance. The top 2 opportunities listed by government veterinarians were education and quality assurance programs. Respondents listed Salmonella spp and E. coli as the most important pathogens in dairy cattle with regard to food safety. More practicing veterinarians than government veterinarians listed paratuberculosis (Johne’s disease) and cryptosporidiosis as the most important zoonoses found on dairies, whereas more government-employed veterinarians than practicing veterinarians listed listeriosis and tuberculosis as the most important zoonoses found on dairies.

One-third of the practitioners reported no impacts on their practice as a result of the antimicrobial resistance issue. The other responses dealt with specific changes in drug dispensing, using fewer drugs, promotion of better drug records, making producers more aware of withdrawal times, better supervision of drug use, a change in practice towards more preventive medicine, and the development of treatment protocols.

Government participants speculated on the impact of the antimicrobial resistance issue on producers and veterinary practitioners. More than half (58%) indicated...
safety services

Dairy practitioners, 1999

Table 2—Ranking (No. of responses) of 8 continuing education topics for practice and personal needs by dairy practitioners, 1999

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<thead>
<tr>
<th>Topics</th>
<th>First</th>
<th>Second</th>
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<th>Fourth</th>
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*Weighted value = Weights of 1.0, 0.75, 0.5, and 0.25 were multiplied by the number of responses ranking first, second, third, and fourth, respectively.

Multivariate logistic regression was used to identify predictors of veterinarians’ beliefs in a current and potential market for on-farm food safety services and their interest in providing these services. The number of years since graduation from veterinary school, whether they were private practitioners or government veterinarians, and whether they expressed a strong interest in offering food safety services were significantly associated with the belief that a current market for food safety services exists (Table 3). As years from graduation increased, veterinarians were less likely to believe that a current market exists. Government veterinarians were more likely to believe that a current market for food safety services exists, compared with practicing veterinarians. If respondents expressed a strong interest in offering on-farm food safety services, compared with no or some interest, they were more likely to believe that a current market exists for those services.

Most respondents believed that a potential market for dairy on-farm food safety services exists. Veterinarians expressed a strong interest in offering food safety services, compared with no or some interest, if they believed that a current market exists for those services, reported that they are already offering

ed that there would be limited access to antimicrobials for on-farm use, and that judicious use and better animal health management would be necessary. Some indicated that there would be a shift away from subtherapeutic use of antimicrobials, and over-the-counter drugs would eventually be less available or eliminated, making veterinary prescriptions required.

When asked if the implementation of HACCP in large- and medium-sized slaughter plants had impacted their clients’ cull cow policies and procedures, 75% of practicing veterinarians reported that there was no impact yet, or they were unaware of any impact. A few indicated that, presently, more care was being taken by clients to reduce injection-site lesions, and several believed that producers were more aware of drug withdrawal times.

The majority (78%) of government-employed vet-

Practitioners were asked to rank the top 4 of 8 topics for their practice and personal needs (Table 2). After weighting by response ranking, the topic of on-farm food safety ranked last. For their own personal interests, most practitioners ranked milk quality first, closely followed by nutrition and dairy records analysis. On-farm food safety ranked sixth by this method.

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some of these services, and listed both residues and pathogens, compared with other issues, as the most important food safety issues facing dairy producers today (Table 3).

Discussion

The veterinarian’s role in food safety has been widely discussed, but, to the authors’ knowledge, the study reported here is the first assessment of continuing education needs for a program in dairy on-farm food safety for veterinarians. The survey targeted practitioners who were those interested in dairy consulting, which is a group that is likely to be interested in new services such as on-farm food safety. Although our study was primarily focused on the western United States, this area has faced important food safety issues concerning cull cattle in recent years. The area represents a large dairy herd environment where many cattle are marketed to slaughter each year. In California alone, we estimate that >30% (>400,000) of the state’s 1.4 million dairy cattle are marketed to slaughter each year.

Most responding dairy and government-employed veterinarians saw a potential market for on-farm food safety services. However, practicing veterinarians ranked other production medicine topics well above food safety for their practice and personal educational needs. Practicing dairy veterinarians appeared unsure of their roles in on-farm food safety and noted that regulatory veterinarians should take the lead in offering these kinds of services to dairy producers, although regulatory veterinarians felt that consultants would be the most appropriate individuals to offer this service.

Recently graduated veterinarians were more likely to believe that a current market exists for on-farm food safety services. It is likely that recent graduates are more willing to offer food safety services because of recent attention paid to food safety in veterinary curricula. Veterinarians were more likely to express a strong interest in offering these services if they believed that a current market existed, reported already offering similar services, and ranked pathogens and residues as the most important issues facing dairy producers. Before we can market a food safety continuing education program, we must convince practicing veterinarians of the market potential for food safety services. Although regulatory veterinarians felt that consultants would be the most appropriate individuals to offer this service, it is likely that recent graduates are more willing to offer food safety services because of recent attention paid to food safety in veterinary curricula.

Results of a recent AVMA study indicated that 39% of industry and agribusiness companies and 60% of livestock producers thought that food safety concerns would increase demand for veterinary services. Sixty-five percent of food animal practitioners surveyed thought that food safety concerns would increase demand for their services. Our survey population of dairy practitioners interested in consulting practice was more likely to believe a potential market exists (86.8%) for on-farm food safety services than express a strong desire to actually offer these services (41.5%). These results indicate that even if food safety concerns increase demand for services, these veterinarians are not yet strongly committed to a role in providing food safety services on dairies. They expressed more interest in learning about other topics applicable to dairy practice, such as nutrition and mastitis control programs, which are topics more directly related to farm profitability.

Results of our study indicate that issues of HACCP in slaughter plants and antimicrobial residues had not yet made a substantial impact on producers and veterinarians. In contrast, packers were considering criteria for incoming cattle, including a premium-based plan for ensuring quality cattle or electing to not purchase cattle from ranches with questionable food safety histories. After our study was completed, the USDA:FSIS reiterated that under HACCP plants are responsible for pathogen reduction and residue control. To control residues, plants may “reject animals with a high risk of violative residues, develop specifications for high-risk classes of animals for residue violations, or buy only from suppliers on a QAP” (quality assurance program). Plants could also “periodically test animals or carcasses for residues; and to convince suppliers of the importance of preventing violative residues, plants could periodically visit suppliers or obtain independent third party verification that good production practices are being implemented.” It is clear from these statements that the onus will be placed on the packers to prevent residues, and that the USDA:FSIS expects that packers will request more of cattle suppliers.

Veterinarians have an opportunity to serve both as food safety educators and third party verifiers of safe food production practices on the dairy farm. To motivate veterinarians to change behavior and provide on-farm food safety services, we must overcome the obstacles to behavioral change. Factors that influence behavioral change include those that predispose or motivate a practitioner to change, those that enable or allow change to occur, and those that reinforce the change. In general, we must demonstrate the value of the new service to the client and the veterinarian to help enable change through effective continuing veterinary medical education and reinforce the change by ensuring that there are rewards or positive outcomes for the efforts. To gain veterinary participation in a food safety continuing veterinary medical education program, we must understand and communicate the client demand for the services, highlight the issues deemed important by potential participants, and demonstrate the ability to incorporate or expand food safety services in veterinary practice.

Although several authors have discussed the role of veterinarians in food safety, none have addressed the concerns raised in our survey, which question how those services may fit into practice and how a veterinarian would be paid for them. If food safety issues put more pressure on dairy producers, the fact that top producers ranked their veterinarian as the primary source of information to help them make management decisions should be emphasized and used in developing and marketing a food safety curriculum. However, ways to incorporate food safety services into practice still need to be addressed. The objectives of a dairy on-farm food safety continuing education program should be to have veteri-
narians understand the market for and their role in on-farm food safety and risk reduction. Veterinarians should understand the industry with which they work and the requirements of milk processors and meat packers for quality raw product. They can provide science-based information regarding on-farm food safety, improve skills in applying and teaching management tools for use by producer-clients to reduce food safety risks, and provide risk assessment techniques for use on clients farms.

Continuing education programs must address the professional, personal, and social forces that shape a practitioner's ability to change behavior. Needs assessment questionnaires should explore the context of the learner: what the learner's perspective is, what shapes the learner's view of educational needs, and what the context is in which the individual will change or attempt to change some aspect of their practice. Our needs assessment survey encouraged respondents to provide comments about what they believed the potential opportunities for themselves were in food safety and what issues concerned them and their clients. Although perceiving a potential market for on-farm food safety services, veterinarians are unsure of their role in this area. New demands of packers slaughterering cul dairy cows may be one motivating factor that practitioners may use to broach the subject of food safety services with clients.

References