Calf care personnel on dairy farms and their educational opportunities

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ABSTRACT

As dairy herd sizes become larger and the organization of the business more complex, targeting communication and education to enhance animal care becomes more difficult. The purpose of this study was to describe selected demographics of calf care employees on large (>500 animals) and small (<501 animals) dairy farms that raise their own calves. Two to 8 individuals per farm involved with calf care, including owners, veterinarians, and calf managers, feeders, and treaters, were interviewed in either English or Spanish. Interviews were conducted in person on 53 dairy farms located in Arizona, Idaho, New York, Oregon, and Washington State. The number of preweaned calves on the farm ranged from 9 to 1,500 (median = 93). A total of 224 individuals were interviewed across 8 job titles. As farm size increased, personnel structure became more complex. Farms with >100 preweaned calves were 15 times more likely to have a calf manager title compared with farms with ≤100 preweaned calves. Eight farms designated the same person as calf manager, treater, and feeder, all with ≤100 preweaned calves. Thirty-two (60%) of the farms had at least 1 full-time calf feeder. Almost 30% of owners and over 40% of veterinarians interviewed were over 50 yr of age, whereas over 40% of the calf managers, feeders, and treaters were under 30 yr of age. Seventy-three percent of feeders and 72% of treaters spoke Spanish at home. For languages in which interviewees were comfortable speaking, more than 30% of owners and 33% of veterinarians were comfortable communicating in Spanish. For calf care employees, 60% of calf managers, 42% of feeders, and 38% of treaters were bilingual (English and Spanish), but most (72%) preferred to be interviewed in Spanish. The level of education varied by job title for those interviewed, but most of the calf care team had high school or less

education. However, some diversity was observed in educational background within job title with almost 38% of the calf managers having at least some college education. The majority of feeders (88%) and treaters (83%) reported being trained by another employee and 66 and 58%, respectively, had not received any continuing education in the previous year. With the amount of diversity seen on these farms, understanding employees' educational backgrounds, language, and generational differences may be valuable when developing training for new procedures for animal health or other aspects of animal care.

Key words: calf management, labor, extension education

INTRODUCTION

The US dairy industry continues to consolidate production into fewer and larger operations, a national trend that is most marked in the western United States. The USDA reported a total of 65,000 herds in the United States in 2012 with over 5% having 500 or more cows, accounting for 55% of total milk cow inventory (USDA NASS, 2012). Management on large dairies has evolved on many farms from an owner-operator model (owners involved with all aspects of the operation) to a distributed model where specialties within the operation have dedicated management and personnel. In a survey commissioned by the National Milk Producers Federation (Adcock et al., 2015), each dairy farm in the United States had an average of 5.1 employees. In this shift to larger farms, the quality and effectiveness of dairy employees are an important component of a dairy's success. If dairy advisors want to affect the health and welfare of the animals, they need to understand and invest in the people responsible for animal care. Effective communication and training are essential in any organization for accomplishment of tasks, job performance, and job satisfaction.

Fostering change on dairies can be difficult because producers are often perceived to be hard to reach (Jan-

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sen et al., 2010a), but Jansen et al. (2010b) suggested that dairy producers were not necessarily hard to reach but had different personalities that either readily accepted outside information or not. Extension programs for dairy producers using a variety of educational models have been shown to be effective (Jansen et al., 2010a). However, these same approaches may not be effective on larger dairies with many employees and may require a very different kind of educational model. Reaching farm employees could require going through another layer of individuals including the farm owner and middle management. To that effect, Kristensen and Jakobsen (2011) suggested that veterinarians and other dairy advisors be trained in communication and directly engage with employees to help effect change rather than provide information to the farm owner and expect it to reach the employees. In a review of dairy management diseases, LeBlanc et al. (2006) noted that although we have made many advances in the science of disease prevention, the challenge is to consistently and effectively implement the appropriate practices within the daily workflow. Importantly, even if a producer is convinced to make a change on the farm, implementation is in the hands of the on-farm work force and requires communication and training to all those involved.

A crucial issue in animal agriculture is prudent antimicrobial use on farms. The issue is of particular importance when employees are empowered to make health care decisions and administer antibiotics to animals in their care. Several studies of calf-rearing practices have highlighted that antimicrobial use for diarrhea, for example, is widespread, even though an antimicrobial might not be warranted in all cases (Zwald et al., 2004; Sawant et al., 2005; Raymond et al., 2006; Friedman et al., 2007; Habing et al., 2016). In 1 study, many different antimicrobials were given more often by calf treaters than a veterinary researcher who based treatment decisions on clinical signs, resulting in no significant difference in mortality, and moreover resulted in more days of diarrhea in those calves receiving antibiotic treatments (Berge et al., 2009). Even in the face of this evidence, changing established practices for treating calves is difficult. Given that over 90% of dairy farmers use antimicrobials for calf diarrhea cases on conventional farms and that in large herds over 85% of those drugs are given by farm employees, it is critical to understand these farm employees before judicious use programs can be implemented (Habing et al., 2016).

To effect a desired change in antimicrobial use in dairy calves, for example, the dairy advisor must understand their clients, in this case, calf care employees. The objective of this project was to describe selected demographics of calf care employees on large and small

dairy farms as part of a larger project to understand on-farm communication with regard to calf health and treatment. One of the aims of this study was to provide background information that might inform educational efforts on prudent antimicrobial use for calf health on dairy farms and calf ranches, particularly for those with multiple employees involved in calf care.

MATERIALS AND METHODS

Surveys

Farm Selection. The study was conducted across 5 US states: Arizona, Idaho, New York, Oregon, and Washington. Farms included in the study were from a convenience sample based on recommendations from extension personnel, practicing veterinarians, and state regulatory veterinarians. The target operations were commercial dairy farms that reared calves on site. Two types of farms were recruited, farms with more than 500 milking cows and herds with fewer than 163 milking cows, with the sample biased toward larger farms to better characterize them. The goal was to include a minimum of 32 large and 14 small dairy farms. This sample size was based on estimating the prevalence of specific communication and training practices as 0.5 with a precision of 0.15 and 95% confidence in the estimate.

Survey Questions. The survey was designed with input on structure and function by the Social and Economic Sciences Research Center at Washington State University (<https://sesrc.wsu.edu/about/>). Selected questions reported here come from a larger study of on-farm communication (Supplemental File S1; <https://doi.org/10.3168/jds.2018-15401>).

Survey Implementation. We used a multi-layered interview process previously developed and tested on dairy farms by Muger and Bitsch (2005). The goal was to interview an average of 4 people on each farm representing the dairy manager/owner, calf manager, primary calf care personnel, and herd veterinarian using a semi-structured Qualitative Research Interview (Kvale and Brinkman, 2009). The number of people interviewed per farm depended on the size and complexity of the operation. A larger number of interviews were needed on the largest enterprises and as few as 2 interviews on the small dairies (owner-operator and veterinarian). The owner-operator in this context meant that the owner was engaged in many or most of the daily on-farm activities and not solely as a business manager. The surveys were delivered in either English or Spanish, depending on the preference of the interviewee. All interviewers were provided training in the conduct of the interview by the Washington State

University Social and Economic Sciences Research Center. This research was reviewed and provided exempt status by the Washington State University Institutional Review Board.

In addition to the individual employee survey, each owner or dairy representative was asked to complete a short survey about the number of employees involved in calf care, numbers of calves, and consultants used. The job definitions used in the study were (1) owner: person who owns the dairy and who may or may not be involved with the daily operations of the dairy; (2) veterinarian: licensed veterinarian who provides veterinary medical consulting, herd health, reproduction services, or a combination of these, on a regular basis; (3) nutritionist: qualified person who provides advice on animal diets, nutrition, and feeding protocols and helps formulate feeds for the dairy on a regular basis; (4) herd manager: person who oversees all aspects of the dairy operation including (but not limited to) personnel, purchasing decisions, and organization of animal and crop work objectives; (5) herdsman: person who oversees animal care activities (feeding, cleaning, treatments) for the milking herd and may also have oversight for calf and heifer care; (6) calf manager: person who oversees all aspects of calf care; (7) calf feeder: person responsible for the calf feeding tasks; and (8) calf treater: person responsible for health assessments and health care interventions including administration of antibiotics. If an individual was identified with more than 1 position title, they were classified as the position with more responsibility (e.g., an individual named as calf manager and calf treater was classified as calf manager for data summaries and analyses).

Data Management and Analysis

Data from each survey were entered into Adobe Acrobat 9 Pro fillable PDF forms (Adobe Inc., San Jose, CA). Once data entry was completed, Adobe Acrobat was used to manage the form data and data files were merged into a spreadsheet that was exported to a spreadsheet program (Microsoft Excel, Microsoft Corp., Redmond, WA). Statistical analysis included descriptive statistics and comparisons of responses by herd size and was accomplished with a statistical software program (version 9.4, SAS Institute Inc., Cary, NC). Odds ratios were used to describe the strength of association with some responses to the survey and calf herd size (categorized from 1 to 4 by quartile distributions: 1 = 0–49 calves; 2 = 50–100 calves; 3 = 101–300 calves; and 4 = 301–1,600 calves), region, and interviewee demographics. Chi-squared analysis was used to assess statistical significance with $P < 0.025$ considered significant and $0.025 < P \leq 0.05$ considered a trend.

RESULTS

Dairy Demographics

We collected farm demographic data on 53 farms enrolled in the project. Farms were located in Arizona ($n = 3$), Idaho ($n = 3$), New York ($n = 23$), Oregon ($n = 2$), and Washington state ($n = 21$). The number of preweaned calves on each farm ranged from 9 to 1,500 (mean = 277, SD = 385, median = 93). Farms were categorized by calf herd size by quartile distributions: 0 to 49 calves ($n = 14$); 50 to 100 calves ($n = 13$); 101 to 300 calves ($n = 14$); and 301 to 1,600 calves ($n = 12$; Table 1). Over 90% of the farms had preweaned calves sourced from a single herd. Eleven of the farms had more than 1 physical location to the operation, but on 88.7% of the operations, cows and calves were kept at the same site. The number of years the dairy operations had been in business ranged from 5 to 146 yr (mean = 51, SD = 26.4, median = 30 yr). Twenty-three percent of the operations had been in business fewer than 16 yr, 23% for 16 to 25 yr, 9% for 26 to 35 yr, 15% for 36 to 45 yr, and 30% for more than 45 yr. No difference was observed in the number of years in business by calf herd size ($P = 0.40$).

On-Farm Personnel and Position Titles

We asked the owners or their representatives about specific position titles on the farm. Twenty-nine farms (54.7%) reported having full-time herd managers. However, on 8 of those farms, the herd manager was also an owner. Twenty-nine farms listed a full-time herdsman with responsibility for calf care, but 8 of those named as herdsman were also named as herd manager. Over 60% of the farms reported having a designated calf manager and 5 of those individuals also served as calf feeder and treater. On 5% of farms employing a calf manager, the position was considered to be part-time and employees had other responsibilities. Thirty-two farms had at least 1 full-time calf feeder. Of the 53 herds, only 35.8% indicated that their calf treater was full-time. All farms had a veterinarian engaged with calf care. Two farms had full-time veterinarians on staff (both with >100 preweaned calves) and 5 farms listed a part-time veterinarian on staff (all with >50 preweaned calves). Most of the farms (90.0%) contracted veterinary services. Three of the farms had a full-time nutritionist on staff (all with >100 calves) and 84.9% of the farms contracted nutrition services.

Farms with >100 preweaned calves were 21 times more likely to identify an individual as a calf manager ($P < 0.0001$) compared with farms with ≤ 100 preweaned calves. Having a full-time feeder or treater was

Table 1. Number of farms and individuals (n = 217) interviewed in specific job titles¹ stratified by calf herd size categories

Calf herd size category	No. of herds	On-farm position title ²						
		Owner	Veterinarian	Herd manager	Herdsmen	Calf manager	Calf feeder	Calf treater
0–49	14	16	14	3	3	3	6	4
50–100	13	14	13	4	2	4	4	3
101–300	14	14	12	5	5	14	7	8
301–1,600	12	10	11	6	0	9	9	14
Total	53	54	50	18	10	30	26	29

¹The nutritionist title was excluded from the table because only 1 nutritionist was interviewed, and 6 individuals interviewed did not have job titles.

²Owner: person who owns the dairy and who may or may not be involved with the daily operations of the dairy; veterinarian: licensed veterinarian who provides veterinary medical consulting, herd health, or reproduction services on a regular basis (or a combination of these); herd manager: person who oversees all aspects of the dairy operation including (but not limited to) personnel, purchasing decisions, and organization of animal and crop work objectives; herdsman: person who oversees animal care activities (feeding, cleaning, treatments) for the milking herd and may also have oversight for calf and heifer care; calf manager: person who oversees all aspects of calf care; calf feeder: person responsible for the calf feeding tasks; and calf treater: person responsible for health assessments and health care interventions including administration of antibiotics.

not associated with preweaned calf herd size. Generally, farms belonging to the largest calf herd size quartile did not have a herdsman involved in calf care.

Individual Interviews

Two hundred twenty-four individuals were interviewed on the 53 farms over a 6-mo time frame. The goal was to interview at least 1 person in each of our 8 defined job titles on each farm. For herds with more than 1 individual in a job position, we interviewed multiple individuals within a title based on availability. For herds without individuals in every job title, we interviewed everyone working with calves. Six surveys were excluded from analyses because they were not associated with a job title, and we completed only 1 interview with a nutritionist, which was also excluded from analysis (Table 1). The median number of interviewees for each herd in the smallest 2 calf-herd size quartiles was 3 and 5 interviewees for each herd in the 2 largest herd size quartiles. Interviews took an average of 45 min to complete.

Survey Demographics

Men were the most common interviewees in each of the position titles (Table 2). Individuals identified as “upper management” (owners, veterinarians, herd managers) tended to be older than individuals working as middle management (herdsman and calf managers) or employees working directly with the calves. Twenty-nine percent of owners and 44.9% of veterinarians were older than 50 yr of age, whereas 40, 65.4, and 44.8% of calf managers, feeders, and treaters, respectively, were 30 yr of age or younger (Table 2).

Individuals were asked about the language they spoke at home and languages in which they felt comfortable communicating. Spanish spoken at home predominated among calf care team members. Sixty-eight percent of calf managers, feeders, and treaters spoke Spanish at home (Table 3). Although 47% indicated that they were comfortable speaking Spanish and English, most (71%) preferred to be interviewed in Spanish. Upper management predominantly spoke English at home. Those classified as herdsman were split between English and Spanish speakers. For languages in which

Table 2. Sex and age for 224 individuals interviewed on 53 dairy farms stratified by on-farm position title

On-farm position title	Sex, no. (%)		Age, no. (%)				
	Female	Male	<26 yr	26–30 yr	31–40 yr	41–50 yr	>50 yr
Owner (n = 53)	8 (15.1)	45 (84.9)	0	1 (10.0)	15 (27.8)	17 (31.5)	14 (28.6)
Veterinarian (n = 50)	3 (6)	47 (94.0)	0	1 (2.0)	14 (28.6)	12 (24.5)	22 (44.9)
Herd manager (n = 18)	1 (5.6)	17 (94.4)	2 (20.0)	5 (27.8)	7 (38.9)	2 (11.1)	3 (16.7)
Herdsmen (n = 10)	3 (30.0)	7 (70.0)	2 (20.0)	1 (10.0)	1 (10.0)	3 (30.0)	3 (30.0)
Calf manager (n = 30)	5 (16.7)	25 (83.3)	5 (16.7)	7 (23.3)	7 (23.3)	6 (20.0)	5 (16.7)
Calf feeder (n = 26)	1 (3.8)	25 (96.2)	9 (34.6)	8 (30.8)	6 (23.1)	2 (7.7)	1 (3.8)
Calf treater (n = 29)	4 (13.8)	25 (86.2)	7 (24.1)	6 (20.7)	6 (20.7)	8 (27.6)	2 (6.9)
Totals	26 (11.7)	197 (88.3)	24 (10.8)	29 (13.0)	57 (25.6)	55 (24.7)	58 (26.0)

Table 3. Languages¹ spoken by 215 individuals in the line of calf care interviewed on 53 dairy farms by job title: language(s) spoken at home

On-farm position title	Language			
	Other	English	Spanish	Spanish/English
Owner	0	54	0	0
Veterinarian	1	49	0	0
Herd manager	0	12	5	1
Herdsmen	0	6	4	0
Calf manager	1	10	18	1
Calf feeder	0	7	19	0
Calf treater	0	8	21	0

¹Some “other” languages excluded from the table.

the interviewees were comfortable speaking, 30.1% of owners and 33.3% of veterinarians were comfortable communicating in Spanish (Table 4). For calf care employees, 60% of calf managers, 42.3% of calf feeders, and 37.9% of calf treaters were bilingual (English and Spanish) (Table 4). We also observed that as calf herd size increased from one quartile to another (1 through 4), the proportion of calf care employees comfortable speaking English decreased from 91.7 to 37.5% (chi-squared for trend, $P < 0.001$). Calf care employees from New York were more than 4 times more likely to be able communicate in English compared with those from the western states ($P = 0.006$) and calf care employees on large farms (>100 calves on premises) were 3 times less likely to be able to communicate in English ($P = 0.05$).

Level of education varied by position title with most of the calf care team having some high school or less education. This varied between positions with 37% of calf managers having attended college, whereas 11 and 24% of calf feeders and treaters, respectively, had attended college. In contrast, 70% of owners and 50% of herd managers had attended college (Table 5). Of the 85 calf care individuals, there was a significant trend for less than a high school education with increasing herd size; in the largest herd category, calf caretakers were 7 times more likely to have less than a high school education compared with the smallest herd size

category ($P = 0.02$). A tendency was observed for calf care personnel to be more likely to have completed high school or gone beyond a high school education in New York herds compared with herds in other sampled states (odds ratio = 2.6; $P = 0.04$).

Training and Continuing Education

In addition to background education, we asked specific questions about training on the farm for calf feeders and treaters. About 88% of calf feeders said they were trained by following experienced feeders. When looking at all the responses by farm, only 44% of farms had interviewees in total agreement (yes or no) to “training by following experienced feeders.” Of all respondents on the farms that did not agree with the majority of responses (29 farms total), they were predominantly the veterinarian (44.8%) and owner (31%). Calf care employees were 3.4 times more likely to report that new feeders were trained by working with experienced feeders compared with those in upper management job titles ($P = 0.002$).

To the question, “How are new members of the [calf] treatment crew trained?” 82.8% of interviewees with the job title of calf treater said they were trained by following experienced treatment crew members. A variety of approaches was reportedly used to train new treatment crew members on the farm, and some interviewees pro-

Table 4. Languages¹ spoken by 215 individuals in the line of calf care interviewed on 53 dairy farms by job title: languages comfortable speaking

Job title	English	English and Dutch	English and Spanish	Dutch, English, Spanish	Spanish
Owner	33	4	15	1	0
Veterinarian	36	0	18	0	0
Herd manager	5	1	13	0	0
Herdsmen	6	0	2	0	1
Calf manager	3	0	18	0	9
Calf feeder	4	0	11	0	11
Calf treater	7	0	11	0	11

¹Some “other” languages excluded from the table.

Table 5. Education level of the calf health care team and dairy management on 53 farms

Job title	Education, ¹ no. (%)						
	No formal education	K–8	Some high school	High school graduate/GED	Some college	University graduate	Graduate or professional degree
Owner	0	0	0	9 (17.0)	15 (28.0)	23 (42.0)	6 (11.0)
Veterinarian	0	0	0	0	0	0	49 (100)
Herd manager	0	1 (5.0)	1 (5.0)	6 (33.0)	4 (22.0)	5 (28.0)	1 (5.0)
Herdsmen	0	1 (10.0)	0	2 (20.0)	2 (20.0)	5 (50.0)	0
Calf manager	1 (3.0)	9 (30.0)	1 (3.0)	8 (27.0)	6 (20.0)	5 (17.0)	0
Calf feeder	1 (4.0)	10 (38.0)	6 (23.0)	5 (19.0)	3 (11.0)	0	0
Calf treater	0	6 (21.0)	8 (28.0)	8 (28.0)	5 (17.0)	2 (7.0)	0

¹K–8 = kindergarten through eighth grade.

vided more than 1 method in their answers. Most of the 224 participants reported that “They follow experienced members” (148; 66.1%), “They are trained one-on-one by the calf manager” (86; 38.4%), or “other” with most of these responses being “one-on-one with the owner or herdsman” (66; 29.5%). Eleven percent of all those interviewed indicated that the veterinarian trained new calf treaters. On 18 of the 52 farms (34.6%), there was total agreement among interviewees to the response of “They follow experienced members.” The veterinarian (15/34) and the owner (12/34) were most likely to be in disagreement with other respondents on their farms. Over 88% of all ($n = 85$) calf care employees responded that they were trained by an experienced employee, and those on larger farms were 22 times more likely to be trained by a farm employee compared with those on smaller farms ($P = 0.003$).

We asked, “How do you gain knowledge of new approaches for calf feeding?” The interviewees with calf feeder as their title gained new knowledge primarily from coworkers (16, 61.5%), their supervisor (8, 30.8%), or some other person (5, 19.3%). When asked, “How do you learn about new approaches for improving

calf health?” calf treaters learned from veterinarians (48.3%), local meetings (41.4%), and coworkers (31%) (Table 6). Few calf care workers used the Internet, extension, or industry magazines. Calf managers learned from the veterinarian (66.7%), coworkers (60%), and local meetings (56.7%), and calf feeders learned primarily from coworkers (Table 6). The herd managers and herdsman relied heavily on the veterinarian. Dairy owners primarily learned about new approaches to calf health from the veterinarian (87%), magazines (70.4%), and dairy industry representatives (63%). The veterinarians (90%) were most reliant on national meetings.

For continuing education (CE), about 23% of calf managers, 55.5% of calf feeders, and 24% of calf treaters had never attended or had not obtained CE in the previous 5 yr. For those that did attend a CE program in the previous 5 yr, local meetings were the most likely type of program but depended on their job title (Tables 7 and 8). No difference was observed among the herd size categories with regard to how recently CE was done. Nevertheless, English-speakers were 1.75 times more likely than Spanish speakers to have participated in CE during the previous 6 mo ($P < 0.001$).

Table 6. Information sources used by dairy employees and management ($n = 224$) to learn about new approaches to manage calf health stratified by job title, on 53 dairy farms

Information source	On-farm position title, no. (%)						
	Owner (53)	Veterinarian (50)	Herd manager (18)	Herdsmen (10)	Calf manager (30)	Calf treater (29)	Calf feeder (26)
Internet/web	22 (40.7)	32 (64.0)	9 (50.0)	5 (50.0)	5 (16.7)	1 (3.4)	2 (7.8)
Veterinarian	47 (87.0)	11 (22.0)	17 (94.4)	8 (80.0)	20 (66.7)	14 (48.3)	8 (30.8)
Extension	17 (31.5)	24 (48.0)	5 (27.8)	3 (30.0)	4 (13.3)	0	0
Supervisor	4 (7.4)	3 (6.0)	3 (16.7)	3 (30.0)	4 (13.3)	5 (17.2)	2 (7.8)
Friends	29 (53.7)	25 (50.0)	8 (44.4)	5 (50.0)	12 (40.0)	3 (10.3)	2 (7.8)
Local meetings	33 (61.1)	39 (78.0)	8 (44.4)	3 (30.0)	17 (56.7)	12 (41.4)	4 (15.4)
National meetings	24 (44.4)	45 (90.0)	4 (22.2)	6 (60.0)	4 (13.3)	0	0
Dairy industry representatives	34 (63.0)	31 (62.0)	9 (50.0)	4 (40.0)	11 (36.7)	3 (10.3)	1 (3.8)
Coworkers	19 (35.2)	35 (70.0)	9 (50.0)	4 (40.0)	18 (60.0)	9 (31.0)	12 (46.2)
Magazine/industry trade	38 (70.4)	33 (66.0)	10 (55.6)	6 (60.0)	9 (30.0)	6 (20.7)	1 (3.8)
Other person	10 (18.5)	18 (36.0)	1 (5.6)	1 (10.0)	4 (13.3)	5 (17.2)	7 (26.9)

Table 7. Description of when and types of continuing education program that interviewees participated in most recently stratified by on-farm position title across 53 dairy farms: How recently did you participate in a continuing education program?

On-farm position title	Time since participating in most recent continuing education program, no. (%)				
	Last 6 mo	6 mo to 1 yr	1 to 5 yr	More than 5 yr	Never attended
Owner	28 (52.0)	12 (22)	11 (20)	2 (4)	1 (2)
Veterinarian	41 (87)	4 (9)	2 (4)	0	0
Herd manager	6 (33)	3 (17)	3 (17)	1 (6)	5 (28)
Herdsmen	3 (30)	3 (30)	2 (20)	1 (10)	1 (10)
Calf manager	10 (33)	3 (10)	10 (33)	2 (7)	5 (17)
Calf feeder	7 (26)	2 (8)	1 (4)	2 (8)	14 (54)
Calf treater	8 (28)	4 (14)	9 (31)	1 (3)	7 (24)

DISCUSSION

It is no surprise that as dairy operations get larger, they also become more complex. One noteworthy finding from this study was that there were differences in claiming different job titles across the farms. Many farms had clear delineations of job titles, and on other farms titles tended to be blurred or covered by the same person, specifically when it came to middle and upper management. This suggests that due to the various job responsibilities a single farm employee may have, it can be difficult to determine their job title. Allocating multiple job titles to a single employee is not necessarily a concern. Moreover, the main focus should be that employees have clear roles, which help clarify expectations for each team member's responsibilities and accountabilities (Mitchell et al., 2012). Clear roles are important to help improve the efficiency of a team-based work force. This can assist in ensuring that 2 employees are not doing the same job or in some cases that someone is actually conducting an important task. An example of an assignment where this is relevant and could go unnoticed is the monitoring and reporting of animal health and disease. Having clear roles and

expectations for each team member's functions, responsibilities, and accountabilities helps optimize team efficiency and often makes it possible to take advantage of division of labor, thereby accomplishing more than the sum of its parts.

Dairy farm employees have been a focus of extension programs for several decades. Training programs have been described for those involved in the parlor, calving management, hoof trimming, and reproduction management, as well as calf rearing. In addition, studies have been done of the employees themselves to better understand the audience, particularly for worker safety training programs for this audience (Menger et al., 2016). However, little has been reported about calf care employees specifically. Rearing preweaned calves on large farms is often considered a separate enterprise and some farmers send neonates to calf ranches or rear calves on separate premises, perhaps making calf-raising less integrated into the dairy operation. To our knowledge this is the first study to survey employees specifically involved in calf care.

Training or CE for employees is positively associated with a dairy farm's return on equity (Stup et al., 2006) and frequent training of employees appears to be

Table 8. Description of when and types of continuing education program that interviewees participated in most recently stratified by on-farm position title across 53 dairy farms: In what type of continuing education program did you most recently participate?

On-farm position title	Type of continuing education program, ¹ no. (%)				
	On-farm program	Local meeting	National meeting	Webinar	CD-based presentation
Owner	6 (11.5)	31 (59.6)	16 (30.7)	5 (9.6)	3 (5.8)
Veterinarian	0	25 (52.0)	21 (43.7)	1 (2.1)	0
Herd manager	3 (23.2)	6 (46.1)	4 (30.8)	0	0
Herdsmen	1 (11.1)	6 (66.7)	1 (11.1)	1 (11.1)	0
Calf manager	4 (16.0)	19 (76.0)	1 (4.0)	0	1 (4.0)
Calf feeder	7 (33.3)	13 (61.9)	0	0	1 (4.8)
Calf treater	2 (16.7)	10 (83.3)	0	0	0

¹Respondents may have participated in more than 1 type of program.

critical to milking efficiency on farms (Rodrigues et al., 2005). However, the time since attendance at a training or CE program varied by job title and language spoken in our study. Durst et al. (2018) reported on dairy employee responses to questions on management. Most employees responded that they received training less than once per year, 11% had never had training, and 36% received training only when they started their job. Conclusions from their study indicated that employees perceived, among other things, that training was a major weakness and these perceptions did not differ between English- or Spanish-speaking employees. In our study, English speakers (primarily upper management) were more likely than Spanish speakers to have participated in recent CE opportunities. Of those directly involved with calf care (mostly Spanish speakers), about 60% had not participated in a program in the previous year. Another possible reason for this difference in training frequency is that less than one-third of the veterinarians spoke Spanish so may not be offering training programs to calf care employees on these farms. In addition, although calving and neonatal calf care extension programs exist for farmers and employees in some states, they are not present in all states and some may not fit with all farms' processes in calf rearing. Not all states have sustainable extension programs that can provide this kind of on-farm training, particularly for Spanish speakers.

Language abilities and preference were not uniform across different job categories. This may create communication barriers for reaching a common objective across different job responsibilities. Communication can be a daily challenge for dairy farmers and employees if they do not speak the same language. Farmers have relied on bilingual middle management to translate farm goals and expectations to Spanish-speaking employees. Bitsch and Yakura (2007) noted that most farm middle managers in their study had little to no training in management but they were required to cover a broad range of human resource management practices. Stup et al. (2007) reported that middle managers rated themselves as low in personnel management. If not trained for this job that requires communication of farm goals and employee management, some middle managers might not be as effective as they could be. If the middle manager is bilingual but not fluent in both languages, there is an opportunity for misunderstandings. An example of a likely misunderstanding from our study is the within-farm disagreement about how new calf treaters are trained. Upper management's ideas about training were different than employees' on several farms. Because extension's traditional role of working directly with dairy farmers has changed as the number of employees on farms has grown, programs for middle

managers as well as other employees are important for animal health care.

Considerations for effective communication, training, and CE may need to include more than just language and culture but also age or generational differences (Gibson et al., 2009). Much has been published on the differences in people from different generations. Generations that might be in a single workplace include baby boomers—born between 1946 and 1964, generation X—born between 1965 and 1976, generation Y, or millennials—born between 1977 and 1997, and generation Z—born after 1997. There is evidence for generational differences in work attitudes (Lyons and Kuron, 2014), and these differences can affect employee retention and motivation (Glass, 2007). In 1 study, members of generation Y were attracted to organizations that invested in training and employee development (Terjesen et al., 2007). At the time of the calf care personnel interviews, about 72% with a calf manager, feeder, or treater title would be considered as part of generation Y or millennial, 3 times more in this group than in upper management.

The different generations are thought to be dissimilar because of different shared histories, social changes, and life experiences (Becton et al., 2014). Some human resources specialists might suggest redesigning management policies and practices within an organization based on these generational differences. Although some generational differences do exist, recent evidence suggests that the stereotypes are not necessarily consistent with behaviors in the workplace (Becton et al., 2014). The strength of identity with a particular generation depends on age (maturation), sex, and education level. Maturity as well as work context can confound the generational stereotypes (Lyons et al., 2014). However, if evaluated across time, there have been personality shifts in the generations, "in general and in relation to work: successive generations appear to be more neurotic, extroverted and conscientious, and regard themselves in an increasingly positive manner" (Lyons et al., 2014). However, Hispanic millennials may be somewhat different than their US-born cohorts. Some evidence indicates that they are more likely than other millennials to look for a workplace where they feel comfortable and see themselves staying for a long time (Coulombe and Gil, 2016).

From a recent thesis on improving productivity in a multigenerational workforce, Beasley (2017) analyzed several organizations' management practices provided from semi-structured interviews. The 2 major themes, effective leadership strategies and retention strategies, were based on the specific subthemes of communication of expectations, teamwork, ongoing training, work-life programs, recognition, knowledge sharing, and feedback

for all employees. For specific training needs, the data suggested that cross-training, re-training older workers on new technology, and cooperative learning and feedback for younger employees were ways to improve productivity in a multi-generational organization. From this, it appears that training is key to an organization's productivity.

Erskine et al. (2015) piloted a survey of management culture on dairy farms with results that suggested extension needed to build capacity for on-farm training and education of employees to stay engaged with dairy operations. Their work also highlighted the important role that veterinarian-initiated education can have on employee attitudes toward their jobs and the economic value perceived by owners. Veterinarians in their study indicated the need for support in this training effort. Extension can provide some information on the audience, through surveys like this and others (Maloney et al., 2016; Durst et al., 2018) as well as content, delivery of content, and program evaluation both directly through employee workshops and indirectly through the farm veterinarian. However, on most of the farms we studied, new calf treaters were trained by other employees.

For both new calf feeders and treaters, most of the training reported in our study was done by following experienced members of the crew. Although the survey did not delve into the specific information provided nor the depth of training, it is likely that, particularly for new calf treaters, they are not being educated on the details of the kinds of antimicrobials and other drugs they are using and the actual indications or contraindications for their use. There is the potential for nonjudicious antimicrobial uses to be perpetuated through employee to employee training. In addition, even if trained once on a treatment protocol, there is the potential for "protocol drift," which has been described for milking procedures training (Erskine et al., 2015). Of equal concern is that there were disagreements within some farms as to how training was actually being done. This result corroborates the finding of Durst et al. (2018) that employers may not agree with the responses of employees, in their example the frequency of training.

Continuing education is an important training source to improve the quality of work by employees responsible for health and production-related work. Some information that CE programs may provide include information of why certain procedures in calf rearing are important and why they are done in a specific way. This knowledge is not only important to develop understanding of the need for consistency when following a protocol, but may also help improve understanding and establishment of common herd health-related objectives

within the farm, reducing potential barriers introduced by miscommunication. Because employees both desire and need to understand the "why" of what they do is important (Erskine et al., 2015), training programs, particularly for new employees responsible for animal treatments, need to include an in-depth introduction to the diseases, their causes, and why certain treatments are appropriate. These programs should be provided by someone able to answer employees' questions on disease and appropriate drug use (i.e., a veterinarian). For example, from research done on 4 calf raising operations, Moore et al. (2015) found large discrepancies in disease detection and decisions to treat between calf treaters and a veterinarian's identification of clinical signs.

The major sources of information on calf health for calf care employees in our survey were coworkers. Few calf care employees used the Internet and even fewer noted extension. Although in many states extension can directly provide calf care training to farm employees, it is likely the veterinarian could have a more expanded role in the initial and ongoing training programs for calf care personnel, particularly for disease detection and treatment. Many dairy veterinarians reported providing farm employee training in 1 study (Salopek et al., 2016), but few veterinarians are likely formally trained to deliver educational programs to dairy farm employees.

The education level of employees varied widely by job title in this study. Forty-percent of calf managers, feeders, and treaters interviewed for our study had not completed high school. Maloney et al. (2016) interviewed over 100 Hispanic dairy employees in New York, and over 40% of those employees had not completed school beyond grade 8. Training for those with less than a high school education may be challenging. A study evaluating knowledge gained after a dairy management workshop identified education level as an important covariate for knowledge improvement (Ashraf et al., 2010). Knowledge improvement was less for trainees with lower education levels. Literacy levels, education, as well as language are important factors to consider when developing training programs (Arcury et al., 2010). When designing worker safety programs for the Hispanic audience, Menger et al. (2016) summarized important considerations for effective training programs, included reading level, the avoidance of stereotypes, and the use of various strategies and learning aids to encourage comprehension. Juárez-Carrillo et al. (2017) conducted focus groups with dairy employees to develop a program for farm safety. The employees preferred face-to-face training in Spanish "with visual information requiring minimal reading that actively incorporates dialogue and opportunities to discuss con-

cerns.” Certainly for calf care employees in our study, educational level and language are important considerations for training.

Caveats to interpretation of the results of this study include the potential for selection bias of farms willing to have employees interviewed. In addition, not every person involved in calf care on every farm elected to be interviewed. However, the sample included a large number of employees, veterinarians, and owners from multiple states.

Although this study did not ask about specific antimicrobial use and attitudes of this audience, more research should be done to better understand the motivations for treatment decisions by calf care employees. More is known about cultural influences on physician prescribing practices and human patient perceptions about antimicrobials than in veterinary medicine or dairy calf health. In a review paper, Toubal-Lundgren et al. (2015) identified some cultural determinants of antimicrobial use. One summary finding was that more “masculine” societies tended to believe that the patient should return to work quickly and that antibiotics are vital to get back to work quickly, whereas “feminine” societies tended to believe that getting back to work quickly was not as important and that antibiotics were not as vital. However, there are many individual determinants of antimicrobial prescribing and patient use including the urgency to “do something.” These factors may play a role in on-farm use as well. Habing et al. (2016) identified different attitudes and threshold levels for use of antimicrobials in calf rearing among conventional and organic dairy farmers. Individuals’ beliefs are likely important determinants to use of antimicrobials, underscoring the need for training that provides evidence for prudent use in a way that resonates with individuals’ beliefs.

CONCLUSIONS

This current study highlighted specific demographics and training opportunities for calf care employees on dairy farms as well as potential challenges. Larger operations had more personnel with distinct job descriptions and middle management, but smaller herd operations also had specialization for calf care. Demographic differences were observed in the groups of individuals working directly with calves compared with upper and middle management, but we observed a lot of diversity within job title groups. Understanding the employees’ roles, educational backgrounds, culture, and generational differences can be valuable for dairy advisors and owners when developing training for animal health or other aspects of animal care. More information is needed to understand lines of communication,

effectiveness of communication, and attitudes on antimicrobial use in this audience of calf care employees to have an effect on prudent use.

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