ABSTRACT

Implementing timely and humane euthanasia in dairy farms remains a critical concern. One of the possible barriers for the implementation of timely euthanasia on-farm is dairy workers’ attitudes toward the act. The objectives of this study were to investigate dairy workers’ attitudes toward dairy cattle euthanasia and their association to individuals’ demographic characteristics. A total of 81 workers from 30 dairy farms (ranging in size from less than 500 to more than 3,000 cows) participated in the survey and most participants were caretakers (n = 45; 55.6%) or farm managers (n = 16; 19.8%), with an average work experience of 14.8 years. Dairy workers’ attitudes toward dairy cattle (empathy affect, empathy attribution, and negative attitudes about cattle), working environment (relying on others, perceived time constraints) and euthanasia decision-making (feeling comfortable with euthanasia, feeling confident, seeking knowledge, using different sources to obtain advice, having negative attitudes about euthanasia, having insufficient knowledge, having trouble deciding when to euthanize and avoiding if possible) were identified and used for cluster analyses. Cluster analyses identified 3 distinct clusters: (1) confident but uncomfortable with euthanasia (n = 40); (2) confident and comfortable with euthanasia (n = 32); and (3) unconfident, lacking knowledge and detached from cattle (n = 9). Dairy workers’ demographic characteristics (age, sex, race and ethnicity, dairy experience, role on-farm, farm size, and previous euthanasia experience) were used as predictors for the risk factor analyses. The risk analysis demonstrated that there were no predictors for cluster 1, but White workers (P = 0.04) and caretakers that had previous euthanasia experience tended to be more likely to be members of cluster 2 (P = 0.07) whereas respondents that worked in farms with 501–1,000 cows were more likely to be grouped in cluster 3. This study provides vital information about variability in dairy workers’ attitudes toward dairy euthanasia as well as its association with race and ethnicity, farm size, and previous euthanasia experience. This information can be used to implement appropriate training and euthanasia protocols to increase both human and dairy cattle welfare on-farm. Key words: attitudes, dairy, timely euthanasia

INTRODUCTION

Optimizing animal welfare conditions on dairy farms in the United States (US) requires producers to prioritize animal welfare from birth to death. Much improvement has been accomplished to improve health, expression of natural behavior and positive affective states on dairy farms (von Keyserlingk and Weary, 2017); however, implementing timely and humane euthanasia remains a critical concern (Walker et al., 2020). A National Animal Health Monitoring System report (NAHMS, 2014) estimates that more than 300,000 dairy cows and 500,000 calves and heifers die unassisted, without the benefit of euthanasia, on an annual basis. Mortality on dairy farms varies across production stage. Pre-weaned heifer mortality was primarily attributed to digestive and respiratory problems (56.4 and 24%, respectively); whereas mature cow deaths were identified as or attributed to nonambulatory, mastitis, injuries and unknown reasons (25, 13.2, 11, and 11.9%, respectively; NAHMS, 2014).

Ensuring timely and humane euthanasia to compromised cows whose likelihood of recovery is poor is an ethical obligation for all individuals who provide care to dairy cattle. However, the act itself is difficult to perform and one major factor associated with failed euthanasia implementation is the emotional component involved in making the decision to euthanize (Román-Muñiz et al., 2021). Choosing to end the life of an animal is highly dependent upon the attitude, willingness, and the emotional response of the individual performing
the act (Edwards-Callaway et al., 2020; Wagner et al., 2020). From a companion animal standpoint, caretakers have been reported to use soft metaphors such as “put to sleep” or “put down” rather than stronger terms such as “killing” to describe euthanasia as a strategy for coping with euthanasia (Kemp et al., 2016). Additionally, the use of metaphors as “doing the right thing” or the “best thing for me and the animal” also seemed to relieve the experience of human suffering (Kemp et al., 2016).

Requesting an unexperienced employee to perform euthanasia may cause a significant amount of stress, which may ultimately lead to job dissatisfaction. Job turnover rates are high in the livestock industry, driven by job satisfaction issues and workforce instability (Limeade, 2020). This situation is even more concerning given that traditional sources of farm workers (family members) are decreasing as family members seek employment opportunities outside of the livestock industry (Panikkar and Barrett, 2021). Additionally, there is a growing challenge in managing and motivating teams of employees, many of whom come from nonfarm backgrounds and have no prior experience working with livestock (English, 2002). Therefore, understanding farm workers’ attitudes toward animals and whether their attitudes are related to their demographic characteristics may help on selecting the most competent employees to perform euthanasia on-farm.

Previous studies have identified some factors influencing human attitudes toward animals and their welfare (Kellert, 1984; Hemsworth, 2003; Serpell, 2004). For instance, the 1984 study reported that sex, pet ownership, age, education and place of residence were demographic characteristics that could influence individuals’ attitudes. More specifically, Kellert (1984) found that farmers, individuals over 76 years of age, residents of rural areas, and males were the least likely to have a humanistic (i.e., strong affection for individual animals) attitude toward animals; whereas livestock producers were the most likely to have negativistic attitudes (i.e., active avoidance of animals due to dislike or fear). In the dairy industry, similar results were reported. For instance, farmers with more negative behavioral attitudes toward cows had a lower proportion of cows that accepted being touched (des Roches et al., 2016), whereas farmers’ positive attitudes toward cows were associated with calmer cows (Ebinghaus et al., 2018).

Specific to attitudes toward livestock euthanasia, research in the swine industry reported that caretakers’ attitudes toward pigs not only influenced their inclinations to perform euthanasia (Coleman and Hemsworth, 2014) but affected the reliability, consistency and quality on how euthanasia was executed (Hemsworth et al., 1994). Furthermore, researchers also found that demographic characteristics such as lack of training and knowledge concerning euthanasia were moderately correlated with swine caretakers’ inadequate decision-making and euthanasia avoidance (Rault et al., 2017). In agreement with the aforementioned results, Campler et al. (2018) found that insufficient perceived knowledge about swine euthanasia was correlated with indecisiveness and avoidance to perform the act and resulted in caretakers feeling guilty.

Specific to attitudes toward dairy cattle euthanasia, a recent study in Canada (Denis-Robichaud et al., 2023) found that participants who felt troubled about the responsibility for ending the life of their animals reported negative emotions more often than those who felt comfortable with this act. In addition, sex and farm size were reported to be associated with attitudes toward euthanasia with women and farmers from small farms more likely to report negative emotions toward euthanasia (Denis-Robichaud et al., 2023). Furthermore, a 2000 study reported that female caretakers showed more positive behavior toward veal calves compared with male caretakers (Lensink et al., 2000).

In the US, dairy workers’ attitudes toward dairy cattle euthanasia and individuals’ demographic characteristics that lead to appropriate euthanasia performance are unknown. Most importantly, euthanasia can negatively affect caretaker mental health and hinder animal welfare via euthanasia avoidance overtime (Román-Muñiz et al., 2021). Given this, the objective of this study aimed to investigate dairy workers’ attitudes toward dairy cattle euthanasia and its association to individuals’ demographic characteristics.

MATERIALS AND METHODS

This study was reviewed and approved by North Carolina State University Institutional Review Board (IRB:24324) for The Use of Human Subjects in Research.

Survey

Dairy farms from North Carolina, California, and Connecticut were recruited to participate in this study and receive complimentary timely euthanasia training using a training tool as part of a larger 2022 interactive euthanasia training program (Merenda et al., 2023). Invitations to participate were sent via email to farm personnel who had actively participated in previous research projects or training activities led by 2 of the co-authors (Eduardo B. de Oliveira and Ashley Robbins). Interested farms worked directly with the authors to schedule training visits. During a 3-mo period (January to March 2022), 2 authors visited the participating farms with 7 different portable laptops and 7 different
headphones to allow each participant to complete the training and survey individually. Any individual currently working on the farm with direct responsibility for animal care was invited to participate.

Before obtaining access to the survey and the training program tested in Merenda et al. (2023), participants were required to sign a consent form allowing the use of their anonymous answers and demographic information by the researchers. Upon signing the consent form, the participants had access to the survey. The surveys were created in both Spanish and English using Qualtrics software (Qualtrics, Provo, UT). The participants were free to choose which language they felt most comfortable with and which production type (cows or calves) was most aligned with their work. Statements between production types were the same with the exception between the word “cow” or “calves” (i.e., “cows are sociable creatures” or “calves are sociable creatures”).

The survey was composed of 2 sections. The survey questions of both sections were adapted to dairy farm workers from previous framework developed by Rault et al. (2017). Rault et al. (2017) designed a questionnaire to assess caretakers’ attitudes toward swine euthanasia, factors related to decision-making (e.g., inadequate knowledge, knowledge seeking, and confidence by self-assessment), and to obtain various caretaker demographic characteristics.

The first section (Appendix) asked questions specific to the participant’s demographic information including age, sex, and ethnicity, place where participants grew up, dairy experience, role on-farm, farm size where the participants worked, previous euthanasia experience, previous livestock experience, previous euthanasia training, and recent euthanasia experience (regardless of the method used).

The second section of the survey consisted of 49 questions in which responses were reported on a 5-point scale, from (1) strongly disagree, (2) disagree, (3) neither agree nor disagree, (4) agree to (5) strongly agree (Table 1). An additional “prefer not to answer” option was also available. The statements addressed empathy, including such statements as “I try to understand cows by imagining how things look from their point of view.” In addition, some statements were related to perceived skillsets and personal knowledge regarding identification, evaluation, and decision-making of sick cows and included statements such as “I have enough time during my workday to identify sick and compromised cows.” Finally, we observed statements related to management, attitudes, and confidence when working with cows and included statements such as “I can determine when a cow needs to be euthanized.”

To ensure that statements were answered carefully and help correct for agreement bias, 4 statements were reverse worded to contain a negation. The scale for these specific questions was reversed with the higher agreement corresponding to a higher score.

**Statistical Analyses**

Cluster, univariate, and multivariable analyses were conducted using Stata/IC 17 (StataCorp., College Station, Texas). The sample size used in this study was based on previous calculations for a larger 2022 interactive euthanasia training program (Merenda et al., 2023). In Merenda et al. (2023), participants were required to fill out a survey before the training (pre-survey), complete the euthanasia training, and then fill out a post-training survey (post-survey). Pre- and post-survey scores were compared and the expected maximum difference between pre- and post-training survey scores was 0.39 points with a variance of 1. A sample size of 82 individuals was calculated to detect 0.39-unit difference in pre- and post-training scores (e.g., pre = 2.40 vs. post = 2.79) while preventing type I (α = 0.10) and type II (β = 0.20) errors. However, the final participation number was 81 individuals.

Data were initially checked for missing data and recording errors. Statement and demographic answers left blank; or selected as “prefer not to answer” were considered missing and excluded from analyses that used those parameters. Basic descriptive analyses were performed including descriptive plots, and basic statistics (mean, SD, range) followed by multivariable analysis in the form of cluster analysis and multivariable risk factor analyses. Then, based on previous research conducted in swine (Rault et al., 2017), responses from different questions were averaged into 12 different variables (Table 1). For instance, 7 questions related to the evoked feelings in the dairy worker were averaged into one variable called “empathy affect” while the responses from 4 questions related to empathy toward cows were averaged into one variable called “empathy attribution,” for further analysis (Rault et al., 2017). Post-hoc analyses of the scale reliability coefficients (Cronbach’s α) for these specific 12 variables (divided between positive or negative) are depicted in Table 1.

Cluster analyses were used as a tool for grouping study participants into groups that were similar in regard to their survey responses. The set of questions included in the cluster analysis was composed by the 12 specific variables from the survey, which did not include the demographic questions. Cluster analyses identified 3 distinct clusters that were further used in the following risk factor analyses.

Three separate mixed effect logistic multivariable models (one for each cluster) were created using membership for each identified cluster as a dichotomous
outcome (yes or no) and age, sex, dairy experience (in years), farm size, role at the farm, race and ethnicity and previous euthanasia experience, as predictors. Because previous euthanasia training could include training by another person in the farm or the farm’s veterinarian and participant interpretation of what euthanasia training was considered could have been different, it was not included in the model as a risk factor. Respondents were considered to have previous euthanasia experience if they ever euthanized an animal, regardless

Table 1. Second section of the survey: Survey statements and attitudes\(^1\)

<table>
<thead>
<tr>
<th>Attitude, Cronbach’s α</th>
<th>Survey statement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive attitudes</td>
<td></td>
</tr>
<tr>
<td>Empathy affect, 0.86</td>
<td>Imagining how a cow feels is something I do often</td>
</tr>
<tr>
<td></td>
<td>I try to understand cows by imagining how things look from their point of view</td>
</tr>
<tr>
<td></td>
<td>When I see cows having fun, I feel really happy</td>
</tr>
<tr>
<td></td>
<td>If I see a cow injure itself, I know how it feels</td>
</tr>
<tr>
<td></td>
<td>When I see an unhappy cow, it upsets me more than it would upset most people</td>
</tr>
<tr>
<td></td>
<td>Seeing a contented cow makes me feel really good</td>
</tr>
<tr>
<td></td>
<td>I am better at telling if a cow is happy than most other people</td>
</tr>
<tr>
<td>Empathy attribution, 0.83</td>
<td>I think of cows as generally able to feel happiness</td>
</tr>
<tr>
<td></td>
<td>Cows have feelings like people have feelings</td>
</tr>
<tr>
<td></td>
<td>Cows are sociable creatures</td>
</tr>
<tr>
<td></td>
<td>I consider that each cow is an individual with its own personality</td>
</tr>
<tr>
<td>Comfortable with euthanasia, NA(^2)</td>
<td>I feel comfortable doing euthanasia</td>
</tr>
<tr>
<td>Confidence, 0.79</td>
<td>When I see a sick cow, I usually know if it will get better</td>
</tr>
<tr>
<td></td>
<td>When I see a sick cow, I usually know what is wrong with it</td>
</tr>
<tr>
<td></td>
<td>I can determine when a cow needs to be euthanized</td>
</tr>
<tr>
<td></td>
<td>It is easy to identify a sick or compromised cow</td>
</tr>
<tr>
<td></td>
<td>I can rely on my coworkers to monitor sick cows when I am away from work</td>
</tr>
<tr>
<td></td>
<td>Coworkers are as good as I am at caring for sick cows</td>
</tr>
<tr>
<td></td>
<td>I do not like to rely on others to continue the care of my sick cows (^3)</td>
</tr>
<tr>
<td>Relying on others, 0.53</td>
<td>I regularly check work instructions to know how to deal with sick cows</td>
</tr>
<tr>
<td></td>
<td>Our vet regularly gives us instructions on how to treat sick cows</td>
</tr>
<tr>
<td></td>
<td>I update my knowledge on sick cow management regularly</td>
</tr>
<tr>
<td>Seek knowledge, 0.59</td>
<td>I use the internet to help me diagnose what is wrong with sick cows</td>
</tr>
<tr>
<td></td>
<td>My supervisor helps me diagnose what is wrong with sick cows</td>
</tr>
<tr>
<td></td>
<td>My vet helps me diagnose what is wrong with sick cows</td>
</tr>
<tr>
<td></td>
<td>I use written protocols to help me identify what is wrong with sick cows</td>
</tr>
<tr>
<td></td>
<td>I rely on coworkers to help me diagnose what is wrong with sick cows</td>
</tr>
<tr>
<td></td>
<td>I ask coworkers for advice on diagnosing sick cows</td>
</tr>
<tr>
<td>Use different sources to obtain advice, 0.77</td>
<td>If I had the choice, I prefer someone else to euthanize cows rather than myself</td>
</tr>
<tr>
<td></td>
<td>I dislike euthanizing cows</td>
</tr>
<tr>
<td></td>
<td>I try to save all cows</td>
</tr>
<tr>
<td></td>
<td>I try not to think about the cow feelings when I euthanize it</td>
</tr>
<tr>
<td>Negative attitudes</td>
<td></td>
</tr>
<tr>
<td>Negative attitudes about euthanasia, 0.47</td>
<td>I do not have enough knowledge to know what to do with sick or compromised cows</td>
</tr>
<tr>
<td></td>
<td>I do not have enough knowledge to know if a cow needs to be euthanized</td>
</tr>
<tr>
<td>Insufficient knowledge, 0.81</td>
<td>Seeing a neglected animal does not affect me as much as it would affect some people</td>
</tr>
<tr>
<td></td>
<td>I do not have enough knowledge to diagnose what is wrong with sick cows</td>
</tr>
<tr>
<td>Negative attitudes about cattle, 0.58</td>
<td>Cows' behavior is not affected by the way we treat them</td>
</tr>
<tr>
<td></td>
<td>I think of cows as generally being dirty</td>
</tr>
<tr>
<td>Perceived time constraints, 0.67</td>
<td>I have too many animals to look after</td>
</tr>
<tr>
<td></td>
<td>Cows are too crowded for me to easily inspect them all properly</td>
</tr>
<tr>
<td></td>
<td>I do my other routine jobs before I inspect the cows each day</td>
</tr>
<tr>
<td></td>
<td>I have enough time during my workday to identify sick and compromised cows (^3)</td>
</tr>
<tr>
<td></td>
<td>I have as much time on the weekends to inspect the cows as I do on the weekdays (^3)</td>
</tr>
<tr>
<td>Trouble deciding when to euthanize and avoid if possible, 0.62</td>
<td>I often feel that there are good reasons for not euthanizing a cow</td>
</tr>
<tr>
<td></td>
<td>I am more likely to euthanize a cow now than 5 years ago (^R)</td>
</tr>
<tr>
<td></td>
<td>I am less likely to euthanize a cow that is closer to calving than other cows</td>
</tr>
<tr>
<td></td>
<td>I know that euthanasia is the right thing to do to stop suffering but I feel bad about doing it</td>
</tr>
</tbody>
</table>

\(^1\)Responses were reported on a 5-point scale, from (1) strongly disagree, (2) disagree, (3) neither agree nor disagree, (4) agree to (5) strongly agree.

\(^2\)NA = nonapplicable.

\(^3\)(R) = The scale was later reversed for analyses with higher score corresponding to a higher agreement.
if it was before or after they started working with cows. Respondents were considered to have recent euthanasia experience if they euthanized an animal in the last 6 mo. Farm was included as a random effect for all models due to the clustering of respondents within dairy farms. The first step of model building was checking for linearity between continuous variables and the log odds of the outcome. Given that this assumption was not met, variables were categorized as follows: dairy cattle experience was divided into 2 categories (0: ≤2 years of experience; 1: >2 years of experience and 2: ≥10 years of experience); age was divided into 2 categories (0: ≤30 years of age and 1: >30 years of age); race and ethnicity was divided up into 3 categories (1 = White; 2 = Latin American; and 3 = African American); farm size (number of cows per farm) was divided up into 5 categories; (1: ≤500; 2: 501–1,000; 3: 1,001–2,000; 4: 2,001–3,000; and 5: ≥3,001) and role on-farm was divided up into 5 categories (1 = caretaker; 2 = department head; 3 = milker or multiple roles; 4 = farm managers; 5 = veterinarians). Following this step, univariable mixed-effects logistic regression models were built and a P-value <0.2 was used for screening predictors to be used in the full final model building. Multicollinearity between variables that moved to the final model was checked using the Spearman correlation coefficient and a cut-off of 0.80. Finally, multivariable mixed models were built using a backward stepwise approach, with final statistical significance declared at P < 0.05 and tendency at 0.05 ≤ P < 0.10.

**RESULTS**

A total of 92 individuals across 33 dairy farms participated in the study. Of the 92 participants, 11 participants failed to complete the questions (missing data points) or chose not to answer and were excluded from the analysis. Therefore, final participation number was 81 workers from 30 different farms. Table 2 depicts the descriptive statistics on demographic information and euthanasia experience from study participants. The Cronbach’s α was low (<0.70) for “relying on others,” “seek knowledge,” “negative attitudes about euthanasia,” “negative attitudes about cattle,” “perceived time constraints,” and “trouble deciding to euthanize and avoid if possible” (Table 1).

**Cluster Analysis**

Cluster analyses identified 3 distinct clusters.

**Cluster 1 (Confident but Uncomfortable with Euthanasia).** Cluster 1 consisted of 40 participants (49.4% of total) who were mainly Latin Americans (72.5%) that have not had recent euthanasia experience in the last 6 mo (67.5%) but have received some euthanasia training (32.5%) and had euthanized an animal before (65%). Their average dairy experience was 14.4 yr (SD = 14.0 yr; min: 4 wk, max: 56 years; skewness: 1.27).

Participants grouped into this cluster appeared to be highly empathetic (Figure 1A) and likely to agree with statements regarding the cows’ ability to have similar feelings as humans (i.e., happiness, unhappiness, sadness after an injury) and in trying to understand how cows feel by imagining how things look from cows’ point of view (Table 1). These individuals also scored high for empathy attribution (Figure 1A) because they were likely to agree with statements regarding cows being friendly, sociable and having their own personality (Table 1). The same individuals had low scores for
having negative attitudes about cattle (Figure 1B) and they disagreed with statements that cows are unfriendly, dirty and that the cows’ behavior is not affected by the way they are treated (Table 1). Even though these individuals were the most uncomfortable with euthanasia, they reported to be highly confident in knowing what was wrong with cows on an early inspection, how probable it was for a sick cow to improve and if a cow needed to be euthanized based on its illness (Figure 1A). In addition, respondents grouped within cluster 1 felt knowledgeable enough to be able to identify and make decisions regarding a compromised cow (Figure 1B).

Respondents in cluster 1 (confident but uncomfortable with euthanasia) were the most likely to trust their coworkers’ skills (i.e., rely on others) to manage sick cows when they were away from work (Figure 1A). In addition, respondents within cluster 1 appeared to be knowledge-seekers (i.e., seek knowledge) and the second most likely cluster to use different sources to obtain advice about sick cow management (e.g., internet, supervisors’ and coworkers’ advice, written protocols and veterinarian instructions; Figure 1A). In addition to being the most uncomfortable with euthanasia, participants in cluster 1 had high scores for “trouble deciding when to euthanize and avoid if possible” (Figure 1B). Participants in cluster 1 also were likely to agree with statements that they waited longer than they should to euthanize an animal and that they usually had good reasons to not euthanize an animal. Moreover, respondents in cluster 1 were likely to agree with the statement that “euthanasia is the right thing to do to stop suffering but I feel bad about doing it” (Table 1). Finally, this group had the highest scores for negative

Figure 1. Clusters’ positive (A) and negative (B) attitudes according to combined survey statements agreement (mean + SD) on a 5-point scale (1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 agree, 5 = strongly agree). Cluster 1: confident and uncomfortable with euthanasia; cluster 2: confident and comfortable with euthanasia; and cluster 3: unconfident, lacking knowledge and detached from cattle. Error bars depict the SD.
attitudes about euthanasia and was then the most likely to agree with statements that they disliked euthanizing cows, they tried to avoid euthanasia (i.e., save all cows), preferred someone else to euthanize cows, and they tried not to think about the cows’ feelings while performing euthanasia (Table 1).

Cluster 2 (Confident and Comfortable with Euthanasia). Cluster 2 consisted of 32 participants (39.5% of total) with its majority being born in the US (59.4%), half of the respondents having euthanized an animal at some point (85%) and in the last 6 mo (46.9%) and the majority having received euthanasia training (62.5%). Their average dairy experience was 14.5 yr (SD = 12.4 yr; min: 6 mo; max: 40 years; skewness: 0.59). These participants were the most comfortable with euthanasia and the most confident regarding identifying a sick or injured cow, likelihood for recovery and need for euthanasia (Figure 1A). In addition, this group demonstrated a high level of empathy toward cows (Figure 1A). Respondents in cluster 2 also had the highest scores for statements implying that they sought knowledge and used different sources to obtain advice about sick cattle management (Figure 1A). They also appeared to be moderately uncomfortable with euthanasia and were the least likely to rely on others for managing sick cows (Figure 1A). Respondents within cluster 3 had the least knowledge about diagnosing sick cows, and the lowest scores for negative attitudes toward euthanasia (Figure 1B). They also had the highest scores for perceived time constraints (Figure 1B) and were likely to be overwhelmed with too many animals to look after, too many chores at work, and that they did not have enough time during weekends to engage in managing sick animals (Table 1). Interestingly, they were the cluster with the lowest scores for “trouble deciding when to euthanize and avoid if possible” (Figure 1B).

Risk Factor Analysis

Table 3 depicts the final risk analysis models for clusters 2 and 3. We detected no statistically significant predictors for the final model of cluster 1.

The final model for cluster 2 included race and ethnicity and previous euthanasia experience as important variables (Table 3). Latin American respondents were less likely to be grouped in the “confident and comfortable with euthanasia” cluster (cluster 2) than White respondents (odds ratio [OR] = 0.36, P = 0.038; Table 3). Respondents that had previous euthanasia experience tended to be more likely to be grouped in cluster 2 than participants that did not have previous euthanasia experience (OR = 2.44, P = 0.072).

The final model for cluster 3 included farm size as the sole important predictor (Table 3). Respondents that worked in farms with 501–1,000 cows were more likely to be grouped in the “unconfident, lacking knowledge and detached from cattle” cluster (cluster 3) compared with participants working in farms with less than 500 cows (OR = 5.90, P = 0.041; cluster 3; Table 3).
This study assessed dairy workers’ attitudes toward dairy cattle euthanasia and its association to individuals’ demographic characteristics which included experience-based factors influencing euthanasia decision-making as well as race and ethnicity and farm size. It is worth noting that 60% of the survey respondents were Hispanic or Latin American. Recruiting Latin American participants to complete the survey improved the study’s external validity given Hispanic labor is the primary labor source for large-herd operations in the US (Jenkins et al., 2009).

Respondents were deemed eligible to participate in the study if they had direct responsibility for animal care. However, when asked about recent euthanasia experience, more than half of the participants (55%) responded that they have not performed euthanasia in the last 6 mo. These results suggest that either euthanasia was not warranted on the farm in the last 6 mo or another individual was responsible for performing euthanasia. In addition, the majority of the survey respondents were caretakers (56%) and may not be granted the ability to make such a decision. These results agree with a study published in 2020 where Wagner et al., (2020a) identified farm owners or farm managers as those primarily responsible for making on-farm euthanasia decisions (34.6 and 34.6%, respectively) and performing on-farm euthanasia (farm owner = 28.5%, farm manager = 30.9%; Wagner et al., 2020a). Future studies should focus on increasing farm manager and owner participation to understand how attitudes and emotions of those directly making and performing euthanasia are different than those caring for the cattle.

The cluster analyses revealed that survey respondents grouped in the confident but uncomfortable with euthanasia cluster (cluster 1) were mainly empathetic Latin Americans with minimal euthanasia training and experience. As already mentioned, Latin American workers encompass the primary labor source for large-herd operations in the US (Wagner et al., 2022; Adcock et al., 2015). This reliance on foreign-born workers can also be illustrated from a dairy product standpoint, with an estimated 79% of US milk being supplied by farms employing foreign-born labor (Adcock et al., 2015). Acknowledging that Latin American workers currently serve and will continue to serve as the main pillar of labor for US dairy farms, it is critical that these individuals have the confidence to make decisions and perform euthanasia when needed.

A primary focus to ensure cluster 1-type workers feel more comfortable with euthanasia is to provide opportunities to educate, train and experience euthanasia in a realistic farm setting (Walker et al., 2020). Previous work in dairy cattle (Merenda et al., 2023) and swine (Campler et al., 2020) demonstrate the importance of training programs in ensuring workers feel more confident in performing job tasks such as euthanasia (Rovai et al., 2016), which can help improve the overall quality of the animal-human relationship (Napolitano et al., 2020). In fact, recent research showed that farmers troubled by the responsibility of ending the life of their animals were the most likely to be interested in training (Denis-Robichaud et al., 2023). It is worth noting that National Dairy Farmers Assuring Responsible Management Program Animal Care Version 4.0 does have requirements for continuing education on euthanasia for caretakers that have that responsibility on the dairy (FARM, 2020). In addition, American Association of Bovine Practitioners guidelines report that those responsible for euthanasia should have annual training and certification on certain aspects of euthanasia (i.e., recognizing animals need of euthanasia, euthanasia technique, confirmation of death, and use of euthanasia methods; AABP, 2019). To date, there is a nationally accessible, free of charge, euthanasia training program available through the National Milk Producers Federation (NMPF, 2022). This program is a 14-case study multimedia training tool that encompasses euthanasia information over 2 production stages (calves and cows/heifers) and materials are primarily delivered in a case scenario format. Given many workers do not have consistent experience performing euthanasia (e.g., 65.4% of all participants did not have recent euthanasia experience), training programs can serve as a realistic tool to learn and feel comfortable about the euthanasia process.

In addition to training and experience, empathetic factors must also be addressed to ensure workers feel more confident in the euthanasia process. Cluster 1 members expressed confidence in determining when a cow should be euthanized but preferred someone else to perform euthanasia. The fact that the members in cluster 1 also believed that cows had feelings similar to humans might have contributed to their preference of having someone else euthanizing the cows. Previous work addressing cultural perspectives specific to dairy cattle euthanasia, demonstrated that on-farm euthanasia resulted in self-perceived emotional burdens for Latin American workers, particularly those that were not previously familiar with or did not understand the decision-making process specific to euthanasia (Román-Muñiz et al., 2021). In addition, 4 of the 5 dairy operations participating in the 2021 study had never discussed euthanasia or their feelings about it in a group setting. When asked about mental health resources to help with the burden caused by performing euthanasia, one of the participants said the topic of de-
pression is never addressed with employees and mental health is not commonly discussed (Román-Muñiz et al., 2021).

The controversial attitude of cluster 1 members (i.e., confidence in determining when a cow should be euthanized but preferring someone else to perform euthanasia) might be further explained by adapting attitude types as a coping strategy. According to English et al. (1992), empathy is one of the main characteristics of good stockmanship and involves gentle and positive interaction with animals on a daily basis. However, in stressful work conditions, empathy in stockpersons can be negatively affected, influencing the relationship and interaction between animal and caretaker. When stressful conditions continue or become chronic in nature, individuals will cope by adapting one of 4 attitude types: concerned detachment, detached detachment, concerned attachment, and attached attachment (Wilkie, 2005).

Briefly, “concerned detachment” is when the animal is perceived as a sentient commodity; “detached detachment” is perceiving the animal as pure commodity, “concerned detachment” is when the animal is individually recognized but is decontextualized and recontextualized; whereas “attached detachment” is the greatest degree of meaningful human-animal interaction (Wilkie, 2005). Adapting this perspective for the dairy farm, dairy workers within cluster 1 may experience attached detachment while raising animals and caring for them while simultaneously adopting a detached detachment attitude in situations similar to performing euthanasia.

Specific to euthanasia, previous research suggests that repeated exposure to animal euthanasia may result in compassion fatigue (Reeve et al., 2005) and frequency can influence empathy with higher euthanasia experience leading to prolonged stress (Rollin, 1986) and decreased empathy (Wahjudi et al., 2019). Given the fact that performing euthanasia influences worker well-being (Román-Muñiz et al., 2021) and euthanasia will remain a critical task that must be performed by those working on-farm, it is imperative to foster a culture of care for both the caretakers and the animals. Future research should address the implementation of coping mechanisms/strategies that decrease mental fatigue associated with dairy cattle euthanasia, such as targeted educational programs in grief counseling and stress management.

In contrast to cluster 1, cluster 2 members were confident and comfortable with euthanasia. Although cluster 1 and 2 shared similar empathetic levels, the majority of cluster 2 members had previous euthanasia experience and training. This reiterates our previous discussion on the importance of training and empha-
to identify sick animals), the lowest scores for empathy affect and attribution and the highest scores for negative attitudes about cattle.

Decreased human-animal interaction is often a common side effect of increased herd size (Robbins et al., 2016). Nonetheless, dairy workers on larger farms tend to be better trained, better paid, more satisfied, and more specialized (Robbins et al., 2016). Furthermore, previous research in swine has shown that the occurrence of negative interactions might also decrease on larger farms (Hemsworth and Coleman, 2011). Therefore, the lowest scores for empathy affect and attribution might be explained by the high workload itself (reflected by their high scores for time constraints) rather than the herds’ size.

Burnout might explain some of the attitudes found in respondents within cluster 3. High-level workload and continuous job demands (e.g., farm work) increase the risk of burnout, which is a serious disorder that affects workers’ well-being and disrupts one’s relationship with work (Schaufeli et al., 1996). Burnout occurs during prolonged stressful situations (e.g., stressful jobs and euthanasia) and displays 3 symptoms: cynicism, exhaustion, and inferior professional efficacy (Kallioniemi et al., 2022). Exhaustion refers to lack of energy and chronic fatigue because of excessive labor, such as farm work, consuming one’s emotional resources; whereas cynicism is characterized by a loss of interest and meaningfulness related to work and is defined as a distant attitude toward work in general (Kallioniemi et al., 2022). Thus, it is reasonable that members of cluster 3 feel so overwhelmed by their work that euthanasia cannot be deemed a priority. However, because the survey questions were not designed to assess burnout, this hypothesis should be more carefully investigated in future research given that it may lead to new discoveries on how burnout is associated with dairy workers’ attitudes toward euthanasia.

Another possible explanation for the negative attitudes of cluster 3 is the lack of dairy experience. Individuals in this cluster were the ones with the lowest dairy experience (5.9 yr) compared with members of cluster 1 and 2 (14.4 and 14.5 yr, respectively). In addition, none of the individuals in this cluster have performed euthanasia in the last 6 mo and most had no previous livestock experience. The lack of euthanasia experience is reinforced by the finding that 77.8% of members of cluster 3 have never euthanized an animal when compared with 35% in cluster 1 and only 15% of cluster 2. Therefore, it could be that these individuals were relatively new to the livestock industry and were neither trained for euthanasia or responsible for its decision-making process.

Results presented in this study provide critical information to the dairy industry regarding workers’ positive and negative attitudes and demographic characteristics involved in the decision-making process of euthanasia. Furthermore, it aids in implementing appropriate training measures that focus on untrained and inexperienced Latin Americans, who were the individuals most uncomfortable and unconfident toward euthanasia. Without an understanding of dairy workers’ attitudes toward euthanasia, there is minimal chance for the industry to implement consistent timely and humane euthanasia.

In the long term, a better understanding of the effect of euthanasia on caretakers may lead to improvement in work satisfaction thus retaining skillful, knowledgeable, and productive workers (Coleman et al., 2000; Hemsworth and Coleman, 2011), a critical priority for the US dairy industry now and in the future.

This study confirms the wide range of attitudes and experience levels related to euthanasia among workers across 30 dairy farms. However, 81 participants characterize a small fraction of the dairy industry workforce. Nonetheless, the study’s aim was not to outline all differences between workers within the dairy industry but rather to generate a snapshot of dairy workers’ attitudes toward euthanasia based on current demographic information. Additional limitations include the absent information about method used for euthanizing. Therefore, participant interpretation of what is considered euthanasia (with certified methods approved by the AVMA) could have been different. Given this, proper euthanasia performance could have been even lower than it was reported herein. Finally, the main methodological limitation to this study was the low internal consistency for some of the constructs. However, lower values are most likely due to the number of statements within each scale, particularly when missing data points are considered.

**CONCLUSIONS**

These survey results describe dairy workers’ attitudes toward dairy cattle euthanasia and its association to individuals’ demographic characteristics. Race and ethnicity, previous euthanasia experience and farm size played a vital role influencing respondents’ attitudes toward dairy cattle euthanasia. White dairy workers and individuals who had previous euthanasia experience felt more comfortable with euthanasia than Latin Americans and individuals that did not have previous euthanasia experience. Individuals working in farms with 501 to 1,000 cows were more likely to feel unconfident, without enough knowledge and detached.
from cattle. The unconfident group was also composed by individuals who had not performed euthanasia in the last 6 mo, had the least livestock experience and have never been trained on euthanasia. Future training activities should focus on Latin Americans, with minimum livestock experience and without previous euthanasia experience because they were the most uncomfortable respondents and had the most negative attitudes toward dairy cattle euthanasia.

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**REFERENCES**


First section of the survey:

What is your age? ____________________________

What is your sex? (Please, select one option)
- Male
- Female
- Choose not to disclose

Please specify your race:
- White, Not Hispanic or Latino Origin
- Hispanic or Latino Origin
- Black or African American
- Native American
- Asian
- Other ______________________________
- Choose not to disclose

Where did you spend most of your time while growing up?
- City
- Town
- Rural
- Choose not to disclose

How long have you worked with dairy cows?
- Months ________________________________
- Years ________________________________
- Choose not to disclose
How would you describe your current role on the dairy farm?

- Farm Manager
- Department Head
- Caretaker
- Other ________________________________

What size of farm do you work on?

- Less than 500 cows
- Between 501–1,000 cows
- Between 1,001–2,000 cows
- Between 2,001–3,000 cows
- Between 3,001–4,000 cows
- Between 4,001–5,000 cows
- Over 5,000 cows

When was the first time you had to euthanize a livestock animal?

- Before I started working with cows
- After I started working with cows
- I have never euthanized an animal
- Choose not to disclose

Did you work with other livestock species before you worked with cows?

- Yes
- No
- Choose not to disclose

I have been trained on euthanasia.

- Yes
- No

I have conducted euthanasia in the last 6 months.

- Yes
- No