

Training Methods and Association with Worker Injury on Colorado Dairies: A Survey

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ABSTRACT. The goals of this study were to define the current methods for training entry-level workers on Colorado dairies, to measure the relationship of training methods to the incidence of work-related injuries on those operations, and to characterize the nature and cause of injuries reported by participating workers. Seventy-two workers from 15 dairies from Weld, Morgan, Larimer and Yuma counties volunteered to be interviewed privately in the language of their choice. Training methods were classified by content (task training versus safety training), method of delivery (on-the-job verbal instruction, on-the-job demonstration, on-the-job supervision, classroom-based, and / or reading materials); and instructor (supervisor and/or co-worker). The majority (84.7%) of interviewed workers were Mexican-born, Spanish-speaking males. Most workers reported the training to be a combination of verbal instruction, demonstration and supervision. Twenty-nine of 72 (40.3%) of all participants suffered at least one work-related injury in the 12 months prior to the interview. Entry-level safety training had no protective effect ($P = 0.463$) on the reported incidence of injury in dairy workers in the previous year. However, workers that received task-related training were four times less likely to suffer a work-related injury ($P = 0.008$). Training conducted by a co-worker also had a significant protective effect against work-related injuries ($P = 0.028$). Dairy workers identified direct contact with livestock or machinery as the main cause for work-related injuries, and most injuries occurred while medicating sick cows and milking. doi:10.1300/J096v11n02_05 [Article copies available for a fee from The Haworth Document Delivery Service: 1-800-HAWORTH. E-mail address: <docdelivery@haworthpress.com> Website: <http://www.HaworthPress.com> © 2006 by The Haworth Press, Inc. All rights reserved.]

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INTRODUCTION

Within the agricultural industry, injury and death result primarily from machinery use, with livestock incidents ranking second;¹ however, in some geographic regions, livestock are the primary sources of worker injury.² Young age,^{3,4} minority status,^{4,5} and, in livestock production, work involving dairy cattle⁶ have been associated with a significantly increased risk of injury. Within the dairy industry, most injuries occur while milking cows or when treating cows for lameness.⁷ In a New York study, laborers sustained most injuries from being kicked, pushed, or fallen upon by dairy cows.⁸ The risk of injury on dairy farms may reflect the intensification of the industry (a trend toward larger farms with animals kept in confinement), the wide variety of tasks that workers perform daily, the proximity to large animals, and the heavy machinery used to manage livestock, maintain facilities, and move feedstuffs.⁹

In the Midwest and Western regions of the United States, 90 percent of migrant farm workers are Hispanic.¹ Many of these farm workers do not have a farm background and their employment in the agricultural sector tends to be entry-level and often temporary.¹⁰ Therefore, familiarity with animal handling is highly variable within this group of workers. Although safety training interventions are available for the dairy industry, these vary tremendously in content and scope,¹¹ and are unlikely to be universally applied or understood by this unique population of entry-level workers. The language and cultural barriers that exist between management and these entry-level workers may complicate the delivery of effective worker safety training on dairies.

To the authors' knowledge, no formal assessment exists of the current worker training practices on dairies in the Western United States. In order to most accurately identify potential areas for improvement in worker training, existing worker training practices must be defined, and the effect (both real and perceived) of training methods on the incidence of injury must be measured. The purposes of this study

were: (1) to define the current methods for training entry-level dairy workers on Colorado dairies; (2) to measure the relationship of training methods to the incidence of work-related injuries; and (3) to characterize work-related injuries and causes of the injuries sustained by workers on Colorado dairies.

METHODS

The owners (managers) of 60 dairies in 14 counties in Colorado, members of the Colorado Livestock Association, were contacted by telephone, mail, and electronic mail between May, 2003 and January, 2004 and voluntary participation in this study was requested. These 14 counties constitute 26.4% of the 53 counties in Colorado in which the dairy industry is located, and account for 48.4% of all dairy farms in the state.¹² Managers from a total of 15 dairies located in Larimer (n = 3), Weld (n = 9), Morgan (n = 2), and Yuma (n = 1) counties agreed to participate in the study. After enrollment, the manager requested voluntary participation in the study by the workers on that dairy; subsequently, one of the investigators (INR) visited the dairy to interview the manager and those workers who had volunteered. In some instances, the investigator would request participation of a group of workers on the day of the interview. Data were obtained by verbal interview between August, 2003 and March, 2004. Fifteen managers (1 per dairy enrolled) were interviewed, and 72 volunteer workers (2-9 workers per enrolled dairy) were interviewed. The survey instrument and surveying procedures were approved by the Human Research Committee of Colorado State University.

The confidential nature of the interview process was discussed with managers and workers and all interviews were conducted individually and privately on the dairy. The survey forms were available both in English and Spanish for the inclusion of Anglo speakers and Spanish-speaking Hispanic workers. The bilingual interviewer read the survey form and recorded the participants' answers. In order to make the

interview process more consistent, all interviews were conducted by the same investigator. At the beginning of each interview, key concepts were clarified for the interviewees. *Task-related training* was defined as training that teaches how to do a job-related task; *safety training* was defined as training that only teaches how to avoid injuries while performing a job-related task. The English version of the survey instrument is shown in Appendix I.

Pearson chi square analysis was utilized to determine the association between determined variables and outcomes of interest (task-related training, safety training, trained by co-worker, trained by supervisor, age of the worker, years of livestock experience, and previous dairy employment versus experiencing a work-related injury in a 12-month period), with a critical α for retention of 0.05. Odds ratios with 95 percent confidence intervals were obtained for variables and outcomes with statistically detectable ($P \leq 0.05$) associations. Statistical analysis was performed using a commercially available statistical software program (Minitab Release 14, Minitab Inc., State College, PA).

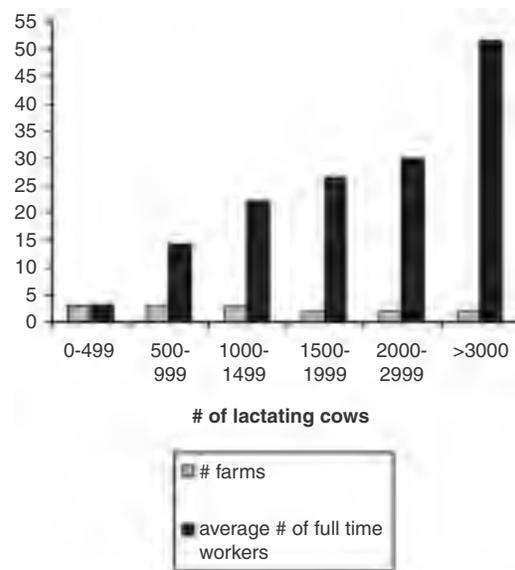
RESULTS

Demographic Data

Participating dairy operations ranged in size from 110 to more than 3000 milking cows and had an average of 22 full-time employees (range, 0-50). Distribution of farm size and number of full-time workers among participating dairy farms is shown in Figure 1.

Sixty-nine (95.8%) of the 72 workers interviewed were of Hispanic origin; the remaining three were white non-Hispanic. Among the Hispanic workers, 67 (97.1%) were Mexican, one was Mexican-Japanese, and one was Spanish. Sixty-three (87.5%) of all workers were male and the median age for all workers was 33 years (range, 18 to 67 years). Fifty-seven (79.2%) workers reported having some experience handling livestock during childhood and/or adolescence and 44 (61.1%) workers had worked on other dairy operations prior to being employed at the current dairy. The length of employment at the current dairy for interviewed workers ranged from 0.25 to 60.0

FIGURE 1. Distribution of Farm Size and Average Number of Full Time Workers for Participating Dairy Farms



months with an average for all interviewees of 43.12 months.

Training Methods

Fourteen (19.4%) workers from eight dairies received no training at all upon being hired at the dairy. Only 53 (73.6%) workers reported having received task-related training upon being hired at the dairy. Forty-one (56.9%) workers reported having received safety training upon being hired. Twenty-nine (50%) of the 58 workers who received task-related and/or safety training were taught by a combination of verbal instruction, demonstration and supervision. The other 29 (50%) workers received classroom-based training or written training materials in addition to verbal instruction, demonstration and supervision. Forty-four (61.1%) workers were instructed by a supervisor and 31 (43.1%) workers were taught by co-workers. Eighteen (25%) workers were taught by both a co-worker and a supervisor.

Rates of Worker Injury and Relationship to Training Method

Twenty-nine (40.3%) of the workers suffered at least one injury in the 12 months prior to the interview. Eight (11.1%) workers suffered

more than one injury in that time period for a total of 43 injury cases. Injuries reported by interviewees ranged from superficial skin lacerations to fractured bones and severed tendons. Lower back pain was reported by four (13.8%) of the 29 workers who suffered work-related injuries. Reported injuries by area of the body affected, cause of injury and severity of injury are shown in Table 1.

Among all the variables measured in the study, *task-related training* ($P = 0.008$) and *training by a co-worker* ($P = 0.028$) were the only variables that showed a significant protective effect against suffering a work-related injury within the 12-month period included in the study. *Age of the worker* ($P = 0.396$), *years of livestock experience* ($P = 0.132$), and *previous dairy employment* ($P = 0.262$) had no statistically detectable effect on risk of injury. The results of chi square analysis for all study variables are listed in Table 2.

Cause of Injury and Perception of Training Efficacy

Workers identified direct contact with cows or bulls as the cause of injury in 22 (51.2%) cases, and contact with equipment as the cause of 12 (27.9%) of the 43 injuries. Three (10.3%) of the 29 workers who experienced work-related injuries were injured after falling, five (17.2%) were kicked (three workers were kicked more than once) and six (20.7%) were pushed, stepped on or fallen upon by cows. Eight of the 43 injuries (18.6%) occurred in the milking area and four (9.3%) occurred while medicating or doing footwork.

TABLE 1. Summary of Work-Related Injuries

Total Injuries = 43				
Body Area Affected	Limbs	Face/Head	Lower Back	Other
		30	5	5
Cause of Injury	Cows/Bulls		Equipment	Other
	22		12	9
Average Work Days Lost per Worker per Year	All Workers	All Injured Workers	Injured Workers Who Sought Medical Attention	As Estimated by Managers
	2.1	5.3	7.7	6.2

TABLE 2. Association Between Variables of Interest and Injury Outcomes

Variable	Chi Square	Degrees of Freedom	P Value	Odds Ratio	95% C.I.
Task-Related Training vs. Injury	6.95	1	0.008	0.23	0.074, 0.716
Safety Training vs. Injury	0.540	1	0.463	0.80	0.309, 2.07
Training by Co-Worker vs. Injury	4.74	1	0.028	0.331	0.120, 0.910
Training by Supervisor vs. Injury	1.80	1	0.180	--	--
Age of Worker vs. Injury	0.721	1	0.396	--	--
Years of Livestock Experience vs. Injury	2.263	1	0.132	--	--
Previous Dairy Employment	1.261	1	0.262	--	--

DISCUSSION

The population of workers interviewed on 15 volunteer dairies closely resembles the population of dairy workers on large dairies in the Western and Midwestern regions of the United States regarding ethnicity, previous livestock experience and reported cause for work-related injuries.

Task-related and safety training currently being offered to employees varied among dairies and within each dairy. Some workers reported receiving both task-related and safety training while other workers reported receiving only one type of training. Some workers reported having received no training at all. A majority of workers characterized the training offered at dairies as a combination of verbal instruction, demonstration and supervision. It is possible that the training that a worker receives upon arrival on a dairy might have been altered according to his or her previous experience or training. It is also possible that changes in personnel that provided the training on a dairy operation could have affected the content and delivery of the task-related and safety training for new employees. Limited recollection of the training process, especially for workers that had been working for that same dairy for a number of years, could have potentially contributed to the variation in training practices reported by participants. Training practices varied among

dairies, most likely due to differences in husbandry practices, organization of manpower, and human resources management.

In this study population, receiving task-related training and being taught by a co-worker had significant, protective effects against work-related injuries. While safety training alone had no protective effect against work-related injuries, it is possible that by incorporating hazard recognition and avoidance into task-related training sessions, safety information can be delivered within a context familiar to the learners, thus leading to more effective retention of information by the workers. It is also possible that a co-worker could convey vital safety information in an informal and more culturally acceptable manner to new employees, better protecting the workers against work-related injuries, than a manager with limited Spanish skills and a poor understanding of the cultural aspects of effective communication.

Although this study was very useful in defining work-related hazards and safety training currently available on Colorado dairies, there were various facets of the study with potential for bias. The method by which dairies were recruited presented an opportunity for bias introduction. Participant dairies were possibly more open to criticism and might be more progressive regarding safety and task-related training practices than those dairies that declined participation. Worker selection by the dairy operator could have also been biased. Because in some instances volunteer workers were chosen by the operator prior to the day of the interview, it is possible that the workers interviewed did not accurately reflect the worker population on that dairy.

Information could have been withheld by workers if they feared loss of confidentiality and possible negative impact on their jobs, although the interviewer did reassure participants that confidentiality of their comments would be rigorously maintained. Lastly, it is feasible that some associations between training practices and work-related injury require a larger sample size to become apparent.

With 40 percent of all interviewed workers being injured at least once in a 12-month period, the dairy industry in Colorado can be considered a hazardous industry. Workers identified direct contact with animals and farm equipment

as main causes. The tasks of medicating sick cows and milking were associated with more than a quarter of all injuries reported by participants. These two areas of the dairy operation hold great potential for reducing the rate of work-related injuries. The findings of this study suggest that training workers about how to perform a task is protective against future injury, perhaps because doing a task properly is inherently safer than improper procedures. Task specific training should be offered to all employees working in these areas of the dairy and safety issues pertinent to the tasks of medicating and milking cows should be a focus of discussion during training interventions. In addition, other intervention strategies such as engineering controls, modification of work organization, and ergonomic approaches might target these areas.

In this study, training on specific tasks by a co-worker had an apparent protective effect against injury on Colorado dairies. The disparity in frequency and type of entry-level training reported by workers from different dairies and workers within each dairy may reflect inconsistencies or inefficiencies in training delivery to entry-level workers, and more formal and consistent methods of training may remedy this disparity. Future research should focus on the efficacy of safety interventions in which safety information is presented within the context of task-related training, rather than provided as a separate training experience. Safety information seen as valuable, meaningful and relevant to everyday experiences should enhance adult learner motivation, and aid with the processes of memorization and recollection in older students.¹³ This study also suggests that incorporating appropriately trained co-workers into training efforts could be very beneficial to training programs. The effectiveness of these interventions should be assessed by conventional objective data (injury rates and the severity of work-related injury pre- and post-intervention) as well as by querying participant workers and dairy operators on such parameters as scope and depth of training, continuation of training, language of delivery, and the cultural sensitivity of delivery.

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APPENDIX 1. Dairy Worker Safety Training Survey

1. Age: _____ years
2. Race/Nationality: _____ Black, African American
 _____ White, non Hispanic origin
 _____ Hispanic (Cuban, Chicano, Puerto Rican, Mexican), specify: _____
 _____ Other: _____
3. Gender: Male Female
4. Did you grow up on a farm? _____ Yes _____ No
5. Did you have livestock experience while growing up? _____ Yes _____ No
6. How many years of experience do you have working with cows?
7. How long have you been working at this dairy? _____ years and _____ months
8. Prior to your current job, did you work on a dairy? _____ Yes _____ No
 If "Yes," please specify the type of dairy: _____ Family dairy _____ Commercial dairy
9. What is your primary job at this dairy?
 _____ milking _____ moving animals _____ feeding
 _____ corral maintenance _____ hospital treatments _____ breeding
 _____ general maintenance _____ calf/heifer rearing

10. Did you receive any task-related training when you arrived at the dairy? Yes No

11. How many hour of task-related training did you receive? _____hours

12. Did the training include worker safety issues? Yes No

13. How many hours of safety training did you receive? _____hours

14. What was the nature of the training you received?

I was taught verbally by co-worker owner/supervisor

I was taught by demonstration by co-worker owner/supervisor

I was supervised for a few days by co-worker owner/supervisor

I participated in a formal training session

I was given training materials to read on my own

N/A

For the following two statements, use the scale provided below:

5- strongly agree

4- somewhat agree

3- neutral

2- somewhat disagree

1- strongly disagree

15. The training that I received helped me to do my job more efficiently _____

16. The training that I received was useful in the prevention of injuries _____

17. Do you believe that more formal worker safety training is needed in order to avoid work related injuries?

Yes No

18. If worker training schools were offered, would you be interested in participating? Yes No

19. Have you suffered any work related injuries in the past 12-months? Yes No

If "Yes,"

20. How many injuries have you suffered in the last 12 months? _____

21. Please complete the table below for injury or injuries suffered in the last 12 months: (additional pages provided if necessary)

Injury*	Cause of Injury†	Date of Injury	Work days lost as a result of the injury	Were you seen by a physician for treatment?	What treatment did you receive?

APPENDIX 1 (continued)

22. Have you experienced any skin-related problems (such as rash, itching, discoloration) from work during the past 12 months?

Yes No

If yes, please describe the condition and cause (if known):

23. Have you experienced any respiratory problems from work during the past 12 months? Yes No

If yes, what symptoms did you experience?

a. Dry cough Yes No

b. Wheezing in chest Yes No

c. Cough with phlegm Yes No

d. Shortness of breath Yes No

24. Do you smoke? Yes, current smoker

No, former smoker

No, never smoked

* Injuries include, but are not limited to: head, neck, upper back, lower back, shoulders, elbows, wrists, hands, hips, thighs, knees, and feet.

† Causes of injury include, but are not limited to: cattle, chemical agents, machinery and other equipment.

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