



Dairy Workforce Development Research Project Updates

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Introduction

In collaboration with Dr. David Douphrate, Dr. Anabel Rodriguez at the UT School of Public Health in San Antonio and others on others within that team, all experts in occupational health and safety, we have been able to conduct multiple studies and education and training projects aimed at determining worker health and safety needs among dairy workers primarily in the New Mexico and West-Texas milkshed. Research projects have also evaluated intervention effectiveness in enhancing worker safety, productivity and efficiency. The below provides a brief overview and update of 3 of the research projects and their findings.

Project 1: Job Factors and Musculoskeletal Symptoms Among Parlor Workers

- **Background:** Working in large-herd milking parlors can be physically demanding and fatiguing. Long work hours, repetitive motions, awkward postures, and forceful muscle exertions can lead to fatigue, diminished performance and even injury among parlor milkers. A follow up investigation sought to identify job factors involved with parlor milking, and their possible associations with the development of work-related musculoskeletal symptoms among parlor workers.
- **Methods:** A total of 450 parlor workers (Texas, New Mexico, Colorado, Utah and South Dakota) were surveyed for work-related musculoskeletal symptoms and milking parlor job factors.
- **Results:** Work-related musculoskeletal symptoms are prevalent among parlor workers as nearly 80% report one or more symptoms, which are primarily located in the upper extremities, specifically shoulders and wrist/hand. Several milking parlor job factors were found to be associated with musculoskeletal symptoms in multiple body regions, including performing the same task repeatedly, limited or insufficient time for the body to rest/recover, static postures,



reaching overhead, and challenging environmental conditions (heat, cold, humidity or wet conditions).

- **Takeaway Message:** Parlor work is physically demanding. Several inherent job factors influence the development of aches, pains or discomfort among parlor milkers, which may also influence a worker's milking performance. Findings from this investigation will lead to the development of job structure or engineering solutions aimed at reducing exposures to job factors known to be associated with the development of work-related musculoskeletal symptoms among parlor workers. These developed solutions will simultaneously improve worker efficiency, productivity, and ease of work.
- Future research updates will include studies involving muscle demand comparisons among workers in different parlor configurations, milking cluster design evaluations, teat scrubber evaluations, worker fatigue and performance, and mobile safety training evaluation.

Project 2: Evaluation of a Semi-Automated Teat Preparation System

- **Background:** Dairy production in the U.S. is moving towards large-herd milking operations resulting in an increase in task specialization and work demands. Large-herd dairy parlor workers experience a high prevalence of musculoskeletal symptoms in the upper extremity. The purpose of this study was to evaluate the effects of an alternative teat scrubber (TS) cow preparation method on upper extremity muscle activity among large-herd parlor workers, as well compare to muscle activity associated with conventional manual milking tasks.
- **Methods:** Upper extremity muscle activity was recorded among fifteen U.S. large-herd parlor workers using surface electromyography. Participants performed multiple task cycles, using both conventional and TS methods. Muscle activity levels were then compared across conventional manual and TS milking tasks.
- **Results:** Conventional manual milking tasks of dip, strip and wipe were associated higher muscle activity levels of the upper trapezius and anterior deltoid. Biceps muscle activity was greatest during teat dip and wipe. Forearm flexor and extensor muscle activity was greatest during teat wipe and dip. The TS system resulted in more desirable anterior deltoid EMG profiles, and less desirable biceps, forearm flexor and extensor profiles.
- **Takeaway Message:** Results suggest that the TS system is effective in reducing anterior deltoid muscle activation levels. The TS system also appears to result in increased biceps, forearm flexor and extensor muscle activation levels. However, increases in muscle activation levels could be offset by reduced repetitiveness resulting from three conventional manual milking tasks being replaced with one TS task.
If parlor production requirements (e.g., quality and consistency) are maintained while simultaneously reducing cumulative muscle loading and worker fatigue, then TS use should be considered in milking parlor operations.



Project 3: Evaluation of Milking Unit Design on Parlor Worker Muscle Activity

- **Background:** Large-herd dairy parlor workers experience a high prevalence of musculoskeletal symptoms in the upper extremity. Additionally, milking unit designs may have differing influences on worker health or performance due to differing anthropometric characteristics of workers. The purpose of this study was to evaluate the effect of milking unit design on upper extremity muscle activity during milking unit attachment task.
- **Methods:** Upper extremity muscle activity was recorded among U.S. large-herd parlor workers using surface electromyography. Parlor workers performed several milking unit attachment cycles with each of six milking unit designs. Muscle activity levels were then compared between unit designs.
- **Results:** Mean muscle activity levels (as a percentage of each worker's maximum muscle activity level) across milking units ranged from 6.8% to 8.2% of maximum for the upper trapezius (shoulder stabilizer), 8.2% to 10.3% for the anterior deltoid (raises arm forward), 13.8% to 17.2% for the forearm flexors (flexes wrist and grips fingers), and 9.9% to 12.4% for the forearm extensors (extends wrist and fingers). A general pattern of higher muscle activity was observed with specific milking unit characteristics. Milking unit weight, milk tube spread, and teat cup shape may explain differences in muscle activity levels.
- **Takeaway Message:** Milking unit design may influence muscle activity levels among parlor workers. Small reductions in muscle activity associated with milking unit design have the potential to delay the onset of fatigue or development of adverse musculoskeletal health outcomes among parlor workers.
- **Relevance to industry:** In addition to milking unit performance and durability, producers should consider worker health and comfort when deciding on milking unit designs. Workers should be provided an opportunity to evaluate designs and provide opinions when making purchase decisions.



**All NMSU offices closed Monday, September 2, 2019
Labor Day Holiday**



Coming Up

The Healthy Cows Workshop - FREE

4:30 to 8:30 p.m.

Friday, September 6, 2019

Rio Arriba County Rural Event Center

Livstock Barn

Abiquiu, NM

(See attached program)

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