

LINER DESIGN AND TEAT TISSUE CHANGES

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Introduction

All milking liners have a range of vacuum where the liner performs at its best. Some of these liners have been matched with a vacuum level by design and others through trial and error. Common knowledge tells us that increasing the system vacuum will result in higher milk flows and lower milking times. This statement remains true for most liners; however, the issue then shifts to teat end health and the cows' response to increased vacuum. One of the most common claims is that increasing vacuum over a certain level will result in poor teat end condition, congestion, and/or edema. The objective of this trial is to demonstrate, through ultrasonic measurements, that two liners (one designed for lower vacuum and one designed for higher vacuum) milked at their specified vacuum levels will result in the same amount of machine induced changes. The conventional liner's, which is characteristic of most liners on the market today, recommended average claw vacuum at peak flow ranges from 10.5 to 12.5 inHg (36 to 42 kPa), and the Tri-Circle[®] liner's recommended range is from 11.5 to 13.5 (39 to 46 kPa) inHg during the same period.

Materials and Methods

Measurements were performed before milking (T_{-1}), immediately after milking (T_0), two hours after milking (T_2), and four hours after milking (T_4). The parameters measured (See Figure 1) were Teat Canal Length (TCL), Teat Diameter (TD), Teat Wall Thickness (TWT), and Cistern Diameter (CD). A hand carried ultrasound system (Sonosite 180+ with 10-5MHz transducer) was used to gather the measurements. Measurements for each treatment (Tri-Circle[®] and conventional) were repeated twice and performed after three consecutive milkings at each set of milking conditions (liner and vacuum combinations). The left front (LF) and right rear (RR) teat were measured on six cows throughout the experiment. To achieve the targeted peak flow vacuum, the vacuum system was set to 14.4 inHg (49 kPa) for the Tri-Circle[®] and 12.5 inHg (42 kPa) for the conventional liner. The TD, CD, and TWT measurements were performed one centimeter from the inside point of the teat canal. In order to determine variability of the measurements, a 30 sample reliability test was performed for each teat parameter measured. The mean difference of the duplicate measurements was: TCL .87%, TD .83%, TWT .34%, and CD 2.67%. These results prove the measurement technique to be effective.

Results

The LF and RR data was separated for analysis. Results indicate there is no difference in teat tissue changes between the two liners and their milking conditions. The data suggests an equal change was seen between the two liners. It also shows the rate of recovery (T_2 and T_4) is equal

between the two liners. Figure 1 shows the change in millimeters (mm) for each of the parameters collected. The data listed in the chart was calculated by subtracting the post milking measurements (T_0 , T_2 , and T_4) from the pre-milking measurement (T_{-1}).

Discussion

The conventional and Tri-Circle[®] liners matched with their recommended vacuum levels showed similar machine induced teat tissue changes. The rate of recovery was also similar between the two treatments. These findings are in agreement with previous research showing similar teat tissue changes under different vacuum levels (Spencer 1997 and Gleeson 2004). This study demonstrates that expectations of machine induced changes in teat tissue for milking with the Tri-Circle[®] Liner at a higher vacuum should not be any different than milking with a conventional liner at a lower vacuum. Therefore, it makes possible the advantages of milking with increased vacuum (higher milk flows and decreased milking times) while avoiding congestion at the teat end and the build-up of hyperkeratosis (Kochman 2009).

Figure 1: Tissue Changes (mm) to Left Front and Right Rear Teats Milked with Tri-Circle[®] and Conventional Liners.

	Left Front Teats					
	Tri-Circle [®]			Conventional		
	Post (T_0)	2hr (T_2)	4hr (T_4)	Post (T_0)	2hr (T_2)	4hr (T_4)
TCL	1.31	1.17	0.60	1.36	1.01	0.68
TD	-2.50	-0.66	-0.07	-2.20	-0.92	-0.13
CD	-6.58	-2.43	-1.16	-6.02	-2.64	-1.68
TWT	1.92	1.00	0.49	1.96	0.67	0.86

	Right Rear Teats					
	Tri-Circle [®]			Conventional		
	Post (T_0)	2hr (T_2)	4hr (T_4)	Post (T_0)	2hr (T_2)	4hr (T_4)
TCL	1.65	1.27	1.43	0.90	0.91	0.93
TD	-1.73	-0.79	-0.47	-1.85	-1.27	-0.86
CD	-4.43	-2.28	-1.64	-4.73	-2.87	-2.66
TWT	1.48	0.60	0.67	1.52	1.08	1.05

References

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