Teat end condition as a factor of properly tuned milking systems

Aaron K. Kochman and Chuck Laney
Lauren AgriSystems, Ltd. | New Philadelphia, Ohio, USA

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Abstract

High claw vacuum settings result in greater milk flow and shorter milking times, yet can result in poor teat end condition, congestion and/or edema if the milking liner design is not suited for high vacuum applications. Our study compares the effects on teat ends of a conventional liner designed for low vacuum to those of a Tri-Circle® silicone liner designed for high vacuum, within correctly tuned systems. The two liners showed similar machine-induced teat tissue changes when used in systems tuned within their respective recommended vacuum levels. These results refute the myth that higher vacuum alone results in lower teat end scores, instead indicating that a higher vacuum in conjunction with a liner designed for low vacuum is to blame for poor teat ends. Consequently, when a milking system is properly set within recommended parameters, using a Tri-Circle silicone liner with high vacuum settings, the effects on teat end condition are similar to that of low-vacuum conventional liners operated at a low vacuum.

Introduction

Improperly tuned milking systems can adversely affect teat end condition and quarter health in dairy cattle. This is most evident in milking systems with claw vacuum levels set outside of the optimum range of performance for the chosen milking liners. All milking liners have a range of vacuum where the liner performs at its best, determined by design or through user experimentation. Common knowledge holds that increasing the system vacuum will result in higher milk flows and lower milking times; however, the issue becomes 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.

Objective

The objective of this trial was to study the effects on teat end condition of milking with two liners at their respective, specified vacuum levels. The "low-vacuum" liner or conventional liner has a recommended average claw vacuum at peak flow range from 10.5 to 12.5 inHg (36 to 42 kPa). The "high-vacuum" Tri-Circle silicone liner has a recommended range between 11.5 and 13.5 inHg (39 to 46 kPa).

Materials and Methods

A hand carried ultrasound system (Sonosite 180+ with 10-5MHz transducer) was used to gather teat end measurements from the left front (LF) and right rear (RR) teat of six cows. The parameters measured (See Table 1) were Teat Canal Length (TCL), Teat Diameter (TD), Teat Wall Thickness (TWT), and Cistern Diameter (CD). The TD, CD, and TWT measurements were performed one centimeter from the inside point of the teat canal. Measurements were repeated twice for each treatment - Tri-Circle and conventional - before milking (T_{-1}), immediately after milking (T_0), two hours after milking (T_2), and four hours after milking (T_4). Measurements were performed after three consecutive milkings at each liner and vacuum combination. 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 to achieve the targeted peak flow vacuum.

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Analysis

A 30-sample reliability test was performed for each measured teat parameter to determine variability, The mean difference of the duplicate measurements was: TCL .87%, TD .83%, TWT .34%, and CD 2.67%, confirming the effectiveness of the measurement technique.

The LF and RR data was separated prior to subtracting the post milking measurements (T_0, T_2, and T_4) from the pre-milking measurement (T_{-1}). The results of this analysis are listed in Table 1.

Results

The data suggests an equal change was seen between the two liners set at different milking conditions. Results indicate there is no difference in teat tissue changes or rate of recovery (T_2 and T_4) between the two liners. Table 1 shows the change in millimeters (mm) for each of the parameters collected.

Discussion

The conventional and Tri-Circle® liners, when operated within their respective recommended vacuum levels, resulted in 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).

Table 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

Gleeson, D.E., E.J. O'Callaghan, and M.V. Rath. 2004. Effect of liner design, pulsator setting, and vacuum level on bovine teat tissue changes and milking characteristics as measured by ultrasonography. Irish Veterinary Journal. 57: 289-296.

Spencer, S.B., L.C. Griel, and J.J. Goldberg. 1997. Ultrasonography of the bovine teat before and after milking. International Symposium on Animal Production. Milano. p 49.

Kochman, A.K. 2009. The effect of liner barrel shape on teat end condition. National Mastitis Council, 48th Annual Meeting, Charlotte, North Carolina.

Lauren AGRISYSTEMS ltd.

2162 Reiser Ave SE
New Philadelphia OH 44663

800-683-0676 | local: 330-339-3373 | fax: 330-308-7370
laurenagrisystems.com | info@laurenagrisystems.com | /TheLinerGuys

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