The effect of footbath pH value on improved claw health with special focus on digital dermatitis in dairy cattle

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Introduction

Digital dermatitis (DD) is an infectious claw disease that is causing enormous loss of production for dairy producers across the globe. The visible lameness associated with the disease is also an animal welfare concern for the industry (Evans, et al 2016). There have been improvements in footbath design, recommended frequencies and proper placement of footbaths but DD is still a major cause of lameness with individual herd prevalence as high as 90% and average prevalence around 43% (Cramer et al., 2008, Solano et al., 2016). Recent studies have shown that the concentrations and low pH of products being used may be the reason that DD is becoming more of an epidemic than improving with the use of footbaths in some herds. (Burgi et al, 2015) This project explored the effect of using a footbath solution with a pH value >3.0 to 5.0 compared to a controlled group with a more traditional pH value <2.0. The higher pH was expected to lower the number of chronic and active lesions resulting in fewer outbreaks.

Materials and Methods

The project used two pens and 675 cows on a commercial Canadian dairy farm with four milking robots (A4 by Lely International. The Netherlands) to record DD lesions using the M-stages (M0, M1, M2, M3 M4) and signs of chronicity (non, hyperkeratotic and proliferative) (Dopfer, et al. 1997, Berry et al., 2012) for 34 weeks. Cows with no M2 lesions are so called type I cows, a single M2 lesion belongs to type II cows and repeated M2 lesions are type III cows. From weeks 1-15 both pens had a footbath with the same dimensions, concentration of CuSo4 and pH <2.0 (avg). Pen walks were performed every two weeks, recorded and the data was analyzed using the prediction model from the DD Check App described by Tremblay. (Tremblay et al 2016). The CuSo4 footbath solution was used 0-4 times/week/pen and was switched from an average starting pH value of 2.0 to an average pH value of 3.2 in Pen 1 between weeks 15 and 17. The footbath solution ending pH value after approximately 100 cow passes was 3.5 (average) compared to initial 15 weeks where the ending pH value was 2.9 (average) in the footbath solution. Hoof trimming was performed on mid lactation, late lactation and lame cows by a professional hoof trimmer every two weeks. Some on farm trimming was performed on lame cows between professional visit. All lactations were included in the project.

Results

After increasing the pH in Pen 1 (the test pen with the average higher pH in the footbath) between 15 and 17, the predictions for the number of M2 stages decreased significantly compared to Pen 2 (see arrows in Figures 1-4). In addition, the number of predicted proliferative lesions were reduced significantly in Pen 1 as well. We interpret this finding of lower M2 and M4P prevalence as a fact that the reservoir of DD is significantly reduced after increasing the pH to an average value of 3.2 to 3.5. Overall the effect of increasing the pH from an average of 2.0 to and average of 3.2 had a very positive effect on DD, particularly in the cows with chronic repeated lesions.

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Conclusions

This project highlighted factors such as the pH of the foot bath that determine if a DD footbath prevention program will be successful or not live up to expectations. The data shows that pH value has a significant influence on the proliferative M4 lesions and on the type III cows with chronic repeated DD lesions. These are the cows that drive the infectious cycle and increased risk for outbreaks within the herd. The project also shows that even though a higher pH value improves footbath effectiveness, it is imperative to manage all aspects of an effective footbath program, This includes design, location , consistency, frequency and most importantly early detection and treatment of ulcerated DD lesions before entering footbath.

Acknowledge

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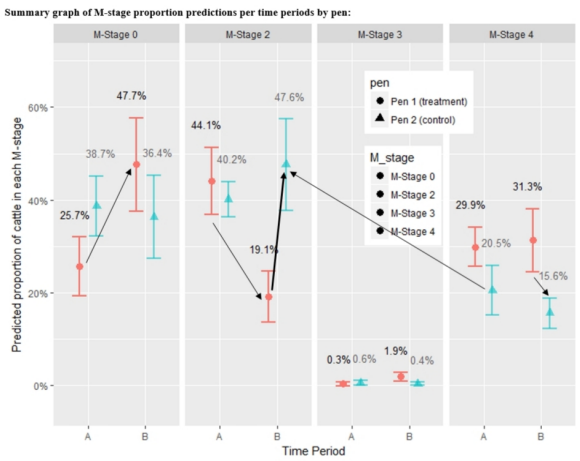

Figure 1: Summary graph of M-Stage proportion predictions per time periods by pen

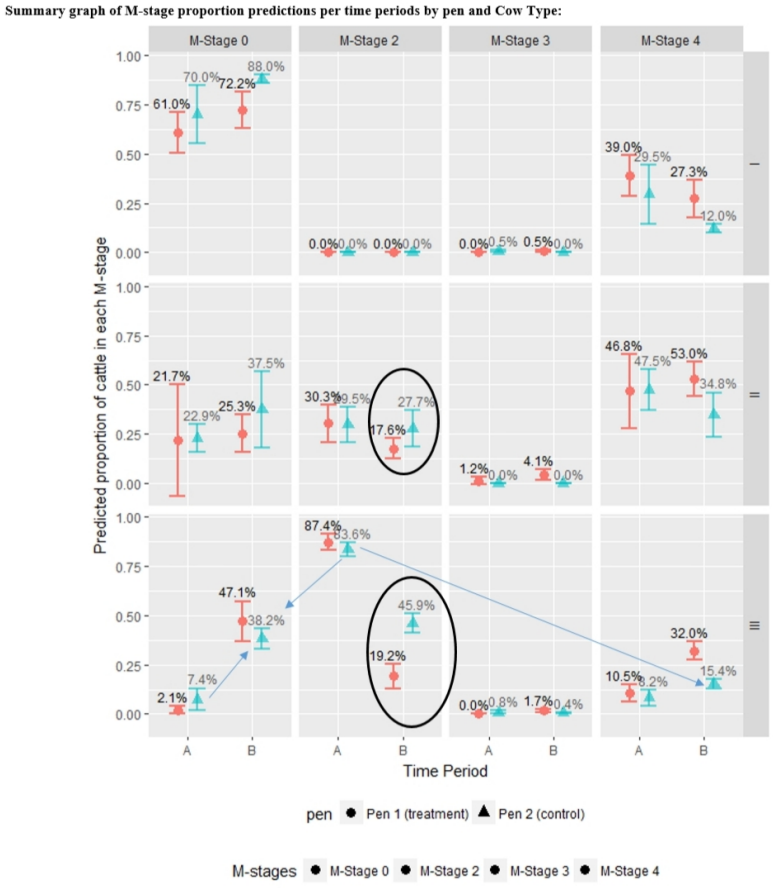

Figure 2: Summary graph of M-stage proportion predictions per time periods by pen and cow type

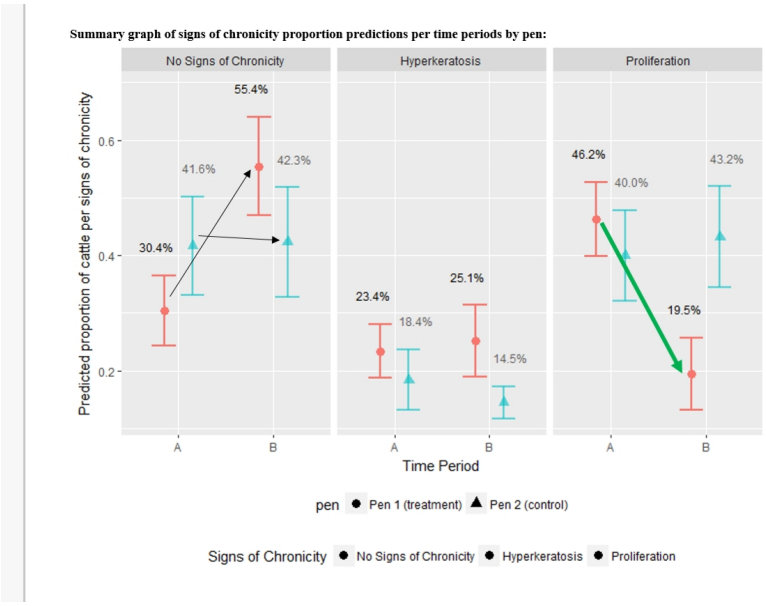

Figure 3: Summary graph of signs of chronicity proportion predictions per time periods by pen

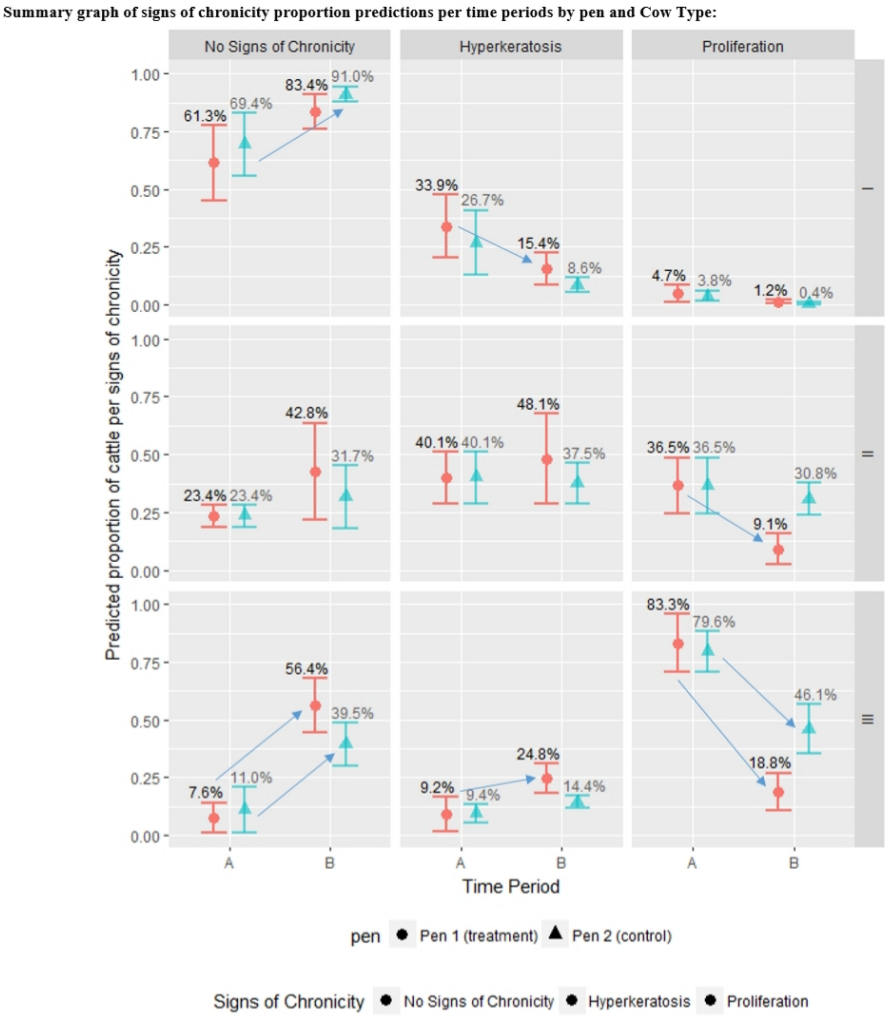

Figure 4: Summary graph of signs of chronicity proportion predictions per time periods by pen and cow type