P2 and P3 development

The ability of the environment to impact development of the bovine foot

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Aim

Lameness negatively affects the well-being and economic productivity of beef and dairy cattle. Hence, evaluation, development and implementation of better management protocols are necessary to produce replacements which have healthy functional feet able to withstand the rigors of the industry. The focus of this study was to evaluate if the boney structures in calves feet will remodel and develop when exposed to rocky terrain.

Methods

A total of eight bull calves, four Holstein and four Jersey, were utilized, with random assignment of four in the control group and four in the treated group with equal number of Jerseys and Holsteins in each group. The control group was reared in accordance with standard practices consistent with the dairy industry, in calf hutches then on pasture following weaning. The treated calves were housed in calf hutches for the first two weeks of life and then they were allowed free access to a shaded sand stall and a half mile lane where they walked for a total of at least two miles a day on rocky terrain. When all calves reached four months of age they were humanely slaughtered and legs were collected and evaluated utilizing Computed Topography (CT) scans. The information from the CT scans was evaluated utilizing two software programs Mimics 14™ (Materialise;http://www.materialise.com/micro-CT) and 3-D Studio Max (Discreet; www.discreet.com/3dsmax.).A three dimensional analysis of the medial claw including; P2 and P3 and the lateral claw including; P2, and P3, of the right rear foot from each calf was performed. The surface area of the individual bones were calculated and evaluated for breed and treated verses control comparisons.

Results

The surface areas of both medial and lateral of P2 and P3 in the treated group were increased in each calf by an average of; 45mm^2 and 81mm^2 and 193mm^2 and 219mm^2, respectively. Additionally, the treated group of Jersey's had a greater average increase per calf in the surface area of lateral P3, 349mm^2 in comparison to the Jersey control group than the average increase per treated Holstein calf, 90mm^2, when compared to the Holstein control group.

Conclusion

In summary, this study implicates the environment's role in the development of the boney structures of the bovine foot. However, additional studies with greater numbers of calves over a longer time period are necessary to allow for maximum bone remodeling so that the environment's impact on the bovine foot can more fully be assessed.