

Is increased oestrogen associated with sinking of the pedal bone around calving?

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Introduction:

Lameness in dairy cattle is common problem negatively affecting the animals' welfare and reducing the herds' profitability. A major part of lameness in dairy cows is caused by claw horn lesions in the hind claws in the months after calving. It is believed that many of these lesions develop when a failure in the suspensory apparatus and supporting tissue leads to a displacement of the pedal bone. Displacement of the bone increases the pressure on the dermis in the sole. This could damage the dermis resulting in bleeding, pain and ultimately disruption of the horn production. It has been suggested that an increase in the blood level concentrations of the calving hormones relaxin and oestrogen in the days around calving softens the suspensory apparatus leading to sinking of the pedal bone. Previously we have shown that the distance between the pedal bone and the sole horn decreased from before calving to after calving in 34 Holstein heifers in a commercial dairy herd (Bach et al 2017). However, the animals in that study were, besides calving, also subject to other factors that could affect the suspensory apparatus. In this study, we therefore examined whether the pedal bone was still sinking around calving when other potential confounding factors were not present, e.g. changes in the environment and feeding, and long standing time. We also examined whether changes happened concurrent with an increase in the blood hormone level of relaxin and oestrogen.

Materials and methods:

Eight pregnant Holstein heifers were housed and calved in separate stalls with rubber flooring. The heifers were housed from one month before expected calving to one month after calving. The animals were only fed grass silage, concentrate and minerals in the entire study period. Twice every week the thickness of the soft tissue between the sole horn and the pedal bone was measured by an ultrasonographic examination made through the sole horn on weight-bearing legs (Bach et al 2019) In the same period, blood was collected twice every week, except in the week before expected calving and the week after calving, where blood samples were collected every day. The blood samples were analysed for relaxin and oestrogen levels by ELISA.

Results and Discussion:

Results are preliminary but suggest that the thickness of the soft tissue between the sole horn and the pedal bone was reduced within the last week before calving, and the thickness did not increase in the 4–6 weeks after calving. The results from the ELISA on relaxin levels in the blood were questionable and it was not possible to determine when or if there was an increase in the blood relaxin level around calving. However, the oestrogen level increased within the last week before calving concurrent with the decrease in soft tissue thickness.

Conclusion:

Even though the heifers were exposed to a minimum of challenges apart from calving, the soft tissue thickness was reduced in the last week before calving and the thickness did not seem to increase over the first month after calving. This reduction in thickness could perhaps be explained by an increase in blood oestrogen concentration the last week before calving. However, the results should be interpreted with caution due to the small number of animals.

References:

Bach K, Nielsen SS, Capion N (2017): Is the bovine pedal bone sinking around calving? Proceedings of the 19th International Symposium & 11th International Conference of Lameness in Ruminants, Munich, Germany 2017: 175-176.
Bach K, Nielsen SS, Danscher AM, Capion N (2019): Ultrasonographical examination of bovine claws through the sole horn on weight-bearing claws. J Dairy Sci 102 (5): 4364-4375.

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