Acta vet. scand. 2003, *Suppl. 97,* 149.

Speed of Sound Measurements in the Evaluation of Bone Properties in Holstein-Friesian Cows: A Preliminary Study

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Sandersen C., Guyot H, Vandeputte S, Carstanjen B., Amory H. and Rollin F: Speed of Sound Measurements in the Evaluation of Bone Properties in Holstein-Friesian Cows: A Preliminary Study. Acta vet. scand. 2003, Suppl 97, 149. – Over the last decade, ultrasound technology has been introduced as a method to analyze bone tissue in human medicine. The measurement of speed of sound at various sites using the axial transmission mode along the cortex gives information about stiffness, architecture, porosity and bone mass. The aim of this study is to establish reference values for healthy non-pregnant and non-lactating Holstein-Friesian cows and to demonstrate the repeatability of the results. Ten healthy 4- to 9-years-old (mean 6.1 ± 1.9 SD) Holstein-Friesian cows with an average weight of 502 kg ± 50 (SD) were used in this study. Measurements were performed on the dorsal and lateral proximal aspects of the right and the left metacarpal bone with the CM probe of the Sunlight Omnisense device (Sunlight Ultrasound Technologies, Tel Aviv, Israel) on two consecutive days. Day-to-day-variability was analysed by ANOVA method for each of the different measurement sites.

Speed of sound measurements ranged from 4060 m/sec to 4675 m/sec with a mean of 4349 ± 97.41 m/sec for the left dorsal metacarpal approach, 4382 ± 87.2 m/sec for the right dorsal metacarpal approach, 4453 ± 123.34 m/sec for the left lateral metacarpal approach and 4460 ± 148.23 m/sec for the right lateral metacarpal approach. Consecutive measurements performed on the same cows (day-to-day variability) were not significantly different ($p > 0.05$) when performed at the dorsal proximal measurement site. Speed of sound measurement seems to be a sensitive method to evaluate bone properties in cows. Measurements are most reliable when performed at the dorsal aspect of the metacarpus. This method could probably be used for the evaluation of bone homeostasis in cows in different conditions, but further studies are needed to confirm this assumption.

speed of sound measurement; bone; bone density; Holstein-Friesian cows.