Smart farming in dairy cattle: application of RumiWatch noseband sensors for monitoring of calving events in dairy cows

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Particular interest of large-scale dairy farming is to benefit from automated detection of occurrences requiring assistance or treatment by the farmer, such as calving, disease, or heat. Therefore, technical monitoring tools for animal behavior are a major focus in the development and marketing of dairy technology. RumiWatch noseband sensors (Agroscope, Ettenhausen, Switzerland) represent a potential predictive tool for calving and disease events, as it allows to monitor both ruminating and eating activity via an animal-attached measuring device with real time on-line analysis and wireless data transmission. This study aimed to identify relevant parameters for calving detection measurable by RumiWatch noseband sensors and to investigate inter- and intra-individual differences in ruminating and eating behavior during the transition period. For data acquisition, 24 dairy cows (Fleckvieh, 6 primiparous, 18 multiparous) were equipped with RumiWatch noseband sensors 7 days before the calculated calving date and monitored for 21 days consecutive to parturition, in order to conduct continuous measurement of behavioral changes in ruminating and eating parameters during the peripartum period. Daily rumination time showed a consecutive decrease, starting from a baseline of 488.8 min/24h (day -3) by -12.1 min/24h (day -2) and -29.4 min/24h (day -1), respectively. Daily rumination time was found to be lowest on the day of parturition (day 0), marked by a decrease of -159.8 min/24h compared to the baseline. Daily eating time showed a decrease, starting from a baseline of 361.1 min/24h (day -3) by -7.6 min/24h (day -2) and -14.1 min/24h (day -1), respectively. On the contrary, daily eating time increased by 21.0 min/24h at the day of parturition (day 0) compared to the baseline. Significant differences in ruminating time were found between lactation days ($p < .0001$) and parity of cows ($p = 0.0059$), whereas eating time significantly differed between lactation days ($p < .0001$). These results reveal significant changes in ruminating and eating activity in the peripartum period that are measurable by RumiWatch noseband sensors, and hence might allow the prediction of approaching calving events. Future research aims for development and validation of reliable detection algorithms for calving and further management-relevant occurrences, e.g. disease and heat.

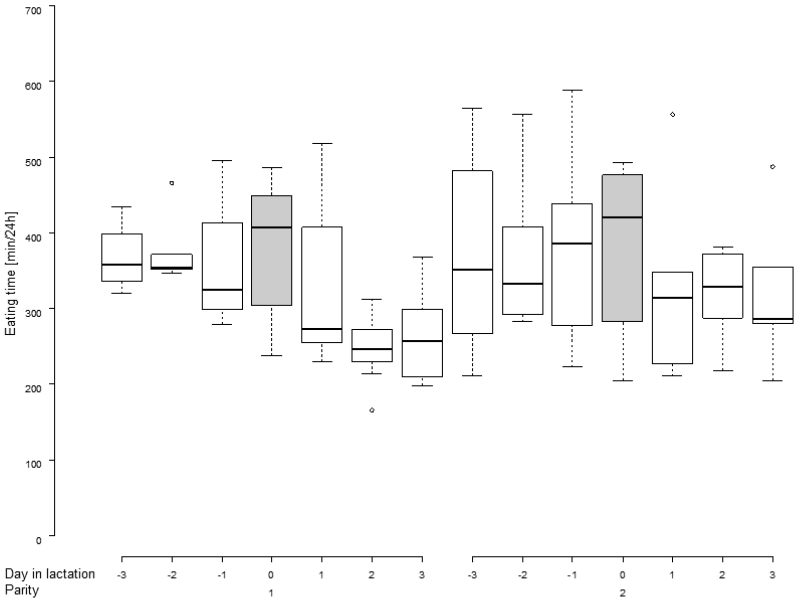

Figure 1: Changes in eating time in the peripartum period (gray: day 0 = day of parturition; n=13 cows)

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