COWS VOCALIZATION AND BEHAVIORAL CHARACTERIZATION DURING EUTOCIC AND DYSTOCIC CALVINGS

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Calving is a painful and stressful event for dairy cows. Continuous monitoring can provide quick and accurate assistance to the cow, reducing stress, pain, and preventing calving difficulties (dystocia). Vocalizations can provide information on cow welfare problems, such as pain. The aims of the current study were: (1) to characterize cows' vocalizations before and during calving and (2) to determine the relationship between cow vocalizations and pain-related behavior in eutocic and dystocic calvings. Ten Holstein cows (five primiparous and five multiparous) were individually housed in a pen and video and audio recorded before and during their calving on a dairy farm in Spain. The recording took 1.5 hours/cow. Four calvings required traction assistance due to abnormal calf presentation and/or a prolonged calving, which were categorized as dystocic. Videos were observed to detect pain-related behaviors, including cow's posture, abdominal contractions, and vocalizations. Vocalizations were categorized on the basis on their acoustic features: duration, fundamental frequency (f0) and spectral properties (bandwidth, centroid, flatness, and roll-off) using the Audacity® software. Vocalizations were classified into three types: "*high*" (416 vocalizations), short and an ascendent f0 with repetitions; "*low*" (7 vocalizations), long and a lower f0; and "*calving*" (122 vocalizations), shorter duration than "*high*" and an ascendent f0. There were differences ($P<0.0001$) between "*high*", "*low*" and "*calving*" vocalizations based on their acoustic features. Linear mixed models and correlations between behavioral and vocalization data were performed using the SPSS® statistical software. Cows with dystocic calving vocalized more than eutocic calving (31.35 ± 5.79 vs. 5.88 ± 4.64, respectively; $P=0.0003$). The incidence of "*high*" and "*calving*" vocalizations was higher in primiparous cows (27.31 ± 5.41) than in multiparous cows (9.92 ± 4.95) ($P = 0.03$). During the 1.5 hours before and during calving, there were positive correlations between vocalizations and abdominal contractions ($r_s = +0.55$; $P = 0.001$), and between vocalizations and the time that cows spent lying in lateral position ($r_s = +0.56$; $P = 0.001$). The vocalizations recorded in this study were associated with pain at calving and dystocia. These results highlight the potential of vocalizations as a useful tool for farmers to detect pain and prevent problems at calving.