

Session 2.2: Advances on monitoring welfare at group and individual level.

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USE OF VOCALIZATIONS TO DETECT PAIN AND DISCOMFORT IN DAIRY COWS AT DRY-OFF

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Identifying and characterizing the acoustic taxonomy of cows' vocalizations might be useful to detect welfare problems such as pain. This study aimed to analyze vocalizations of dairy cattle to determine their acoustic characteristics related to the potential pain and stress associated with the drying-off (abrupt cessation of milking, change of pen and re-grouping, and change of diet). An environmental microphone was placed above a pen with six cows starting the dry-off process. The cows had a milk production of 13.24 ± 7.35 liters per day before dry-off. The audio recording lasted five days uninterruptedly (101.5 hours recorded). Mechanical nociceptive thresholds (MNTs) were measured using a hand-held algometer to assess the pain due to udder engorgement. Additionally, a behavioral pain score was built with direct observations of pain-related behaviors (cow's attention, ear position, facial expression, back position, head position, tail position, limb posture, and lying position; from a score of 0 or painless to score 13 or severe pain) was also obtained. Statistical analyses were performed with a Glimmix model. Two kinds of vocalizations were identified based on listening and spectrogram analyses using the Audacity® software: i) "high vocalization", short and with an ascendent fundamental frequency (f_0) with repetitions; and ii) "low vocalization", longer and with a lower f_0 . In addition to these parameters, other spectral characteristics were computed for the two types of vocalizations. Significant differences were found for the duration, f_0 , and spectral bandwidth between *High* and *Low* vocalizations. *High* vocalizations average incidence per cow was higher on the second and third days after dry-off ($P < 0.05$) compared to other days studied (day 1: 0 ± 0.00 ; day 2: 6.41 ± 10.81 ; day 3: 4.41 ± 6.62 ; day 4: 1.00 ± 2.37 ; day 5: 1.08 ± 2.35). After dry-off, the total number of vocalizations decreased over the five days ($P < 0.05$). The pain score was higher on days three and four than on other days studied (day 1: 0.50 ± 0.54 ; day 2: 0.75 ± 0.62 ; day 3: 1.91 ± 1.31 ; day 4: 1.58 ± 1.16 ; day 5: 0.66 ± 0.77 ; $P < 0.05$). The MNTs values were different across the five days assessed ($P < 0.05$). The third day had the lowest MNT measurement (23.35 ± 0.18 Newtons), and the fifth day presented the highest MNT measurement (24.60 ± 0.18 Newtons). Also, there was an interaction between factor cow and day ($P < 0.05$). In the current study, the contemporaneity of *High* vocalizations, pain score, and MNTs might elucidate the possibility that vocalizations are related to the expression of pain, stress, and/or discomfort produced by the dry-off. These results may help understand dairy cows' welfare based on their vocalizations. Vocalizations show a big potential to assist farmers in detecting welfare problems and facilitate rapid interventions to mitigate them.