

**Estrus behavior in high-yielding dairy cows in a wind tunnel compost barn system**

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The difficulty of detecting estrus is still a limiting factor for the reproductive efficiency of high-yielding dairy cows managed in confined systems. Estrus expression can be affected by environmental factors inherent in confinement systems, thus the identification of factors that affect estrus behavior may contribute to increasing the efficiency of estrus detection. The objectives of this study were to characterize the estrus behavior of high-yielding dairy cows housed in a wind tunnel compost barn system and to verify the effects of environmental and physiological variables on estrus duration and intensity. Thirty-five Holstein cows (36.6 ± 7.24 L milk day⁻¹ and 128 ± 74 days in milk) underwent a hormonal protocol for fixed-time artificial insemination. Estrus behavior was continuously monitored by direct visual observation, video cameras, and electronic activity monitoring collars from 12 to 72 h after the end of the hormonal protocol. The environmental variables inside the barn (temperature, relative humidity, temperature and humidity index, wind speed, and temperature and moisture of the bedding material) and physiological variables (rectal temperature, respiratory rate, milk production, and days in milk) were measured. Correlation and regression analyses were carried out of the estrus duration and of the time interval to onset of estrus estimated by the electronic collars and determined by video-assisted visual observation. Stepwise multiple regression analyses were performed to evaluate the influence of environmental and physiological variables on the duration and intensity of estrus. The duration of estrus detected by visual observation aided by video cameras was 12.8 ± 1.6 h, whereas the one detected by the activity monitoring collars was 20.6 ± 3.9 h; hence there was no correlation ($r = 0.12$, $P > 0.05$) between them. The interval between the end of the synchronization protocol and the beginning of estrus determined by these two detection methods was correlated ($r = 0.53$, $P < 0.05$); however, the activity monitoring collars underestimated shorter intervals and overestimated longer intervals ($P < 0.01$). The most common estrus behaviors were: acceptance of mounting (37.9 ± 6.7 , 22.4%), attempting to mount from behind (54.5 ± 9.3 , 32.2%), and head-to-head contact (46.6 ± 10.6 , 27.6%), which were mostly concentrated from 11:01 am to 5:00 pm. Among the variables studied, wind speed and bedding moisture content were the most common determinants of estrus duration and intensity, respectively. The speed of wind and the bedding moisture content on the estrus day were 2.05 ± 0.08 m/s and $50.10 \pm 0.29\%$, respectively. It was concluded that dairy cows housed in the wind tunnel compost barn system exhibited long-duration and high-intensity estrus. In addition, the electronic activity monitoring collars used in this study provided highly efficient estrus detection, but there was a delay in the emission of the alert related to the onset of estrus.

Keywords: animal welfare, electronic activity monitoring system, standing estrus.

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