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*One Health*

L'Animal et l'Homme, une même santé



### **Optimizing heat stress detection in dairy cattle: leveraging datamining and unsupervised analyses to explore individual-level impact through behavior and meteorological factors**

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Dairy cows have various strategies for coping with heat stress, including a change in behavior. The aim of this study was to explore, via unsupervised learning, the behavior of cows and to relate it to their environment using the comprehensive climate index. A total of 8,928 observations, associated with behaviors known to be influenced by heat stress, per cow over the month of August 2020 were recorded from a herd of 28 grazing cows. The CCI was established for each day using radiation, relative humidity, ambient temperature and wind speed. Hopkins statistic was used to measure the clustering potential of the observations, with a value of 0.812 indicating strong clustering of the data. A principal component analysis was performed to determine the number of groups to be formed based on the data. Visualization of dimensions 1 and 2, which explain 58.81% of the variability in the data. The unsupervised learning method of k-means partitioning was implemented in order to form 4 distinct groups and outliers in each group were removed using the Mahalanobis distance method based on a p-value of less than 0.05. The interpretation of the groups was based on the average of the behaviors. A correlation of 0.44 was established between the first group and the increase of CCI. The potential prospects of this study are to provide a better understanding of the individual responses of cattle to heat stress and to improve health management. In addition to an approach based on behavior and not on an index, future predictive models could subsequently be implemented to enable early adaptation in the face of events unfavorable to animal welfare.

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### **Welfare and resting behaviour of group-housed horses kept in loose housings: on farm assessment using the AWIN welfare protocol and time budget evaluation**

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The welfare of 156 horses kept in bare outdoor areas, with and without a Track design, was evaluated during the winter 2020 in Belgium using the AWIN welfare protocol (4 environment-based, 22 animal-based indicators) and a time budget evaluation. Data analysis included descriptive analysis, non-parametric tests and regression ( $p < 0.05$ ). Assessed horses had sufficient access to water and forage and a mean body condition score of  $3.2 \pm 0.5$  (scale of 5), nearly 30% were slightly overweighted. All horses could move freely and interact with conspecifics. The time budget indicated that a Track design and more surface significantly increased movement (walk and trot), but a Track design also increased alert posture, a potential stress indicator. Rest might be a concern, with insufficient shelter area (53.8%) and lack of bedding (75%) as a dry soft substrate is necessary to lie down and reach REM sleep. Episodes of excessive daytime sleepiness (EDS) were observed in 7 horses, some to the point of partial collapse, with less lying area provided, the more likely to observe EDS episodes (Spearman:  $S=1021.7$ ,  $\rho = -0.82$ ,  $p\text{-value} < 0.001$ ). Wounds, coughing and lameness were rare. Alopecia were present in 50.6% of horses. Serous ocular and nasal discharges were seen in 37.2 and 14.1% of horses, which is higher than in pastured horses. Stereotypy were rare (1.3% of horses). Horses showed positive human-animal relationships with high scores on approach (98.1%) and forced (87.8%) tests. In conclusion, outdoor group housings were adequate for the horses even during the winter, providing adequate health and covering basic behavioural needs. An appropriate resting area should be provided.