

UMR Herbivores

Behaviour, health, and welfare Team (Caraibe)

Monitoring of the behaviour and welfare of cows thanks to a real time locating system

Precision Livestock Farming (PLF) is expanding. We explored the possibilities of a real time locating system for cows indoors to provide information on cows' health and welfare, beyond the applications offered by the manufacturer. From the position and movement of the animal, its general activity is estimated (feeding, rest, movement, ...). The distance between the animals can also be calculated. From this basic information, we propose other calculations: time spent brushing or licking salt, daily activity rhythm, identification of social networks within groups. These elements are modified under diseases or disturbances (social or otherwise) of animals. Thus, although initially designed to improve production efficiency, precision livestock farming tools could be used to monitor animal behaviour and improve their welfare with, for example, earlier detection of disease or other situations of malaise.

Precision livestock farming is booming. Although initially designed to improve production efficiency, Precision livestock farming tools could be used to track animal behavior and welfare. We explored the value of a real-time positioning system for animals to extract information on their behavior and well-being.

We used the CowView system proposed by GEA for dairy herds. A transmitter is placed on the collar of each cow and antennas placed in the barn allow to know the position of the animal by triangulation (1 data / s). From the position and movement of the animal, the system estimates its general activity: when the cow is near the trough, she is considered as eating; when she is in the corridors, she may be either walking or standing still; when she is in the cubicle, she is resting. From this basic information, we explored several applications:

- we calculate the level of activity of the animal hour by hour and describe its circadian rhythm. It is modified during oestrus, inflammatory diseases (eg mastitis) and lameness;
- we estimate the time spent in specific activities: time spent licking salt, time spent using the brush;
- we calculate the distance between animals, which makes it possible to identify the social networks within the groups.

Using these new indicators, we observed:

- changes in the rhythm of activity before the appearance of mastitis (hyperactivity and day / night variations less marked), lameness (day / night variations less marked without modification of the average level of activity), or during episodes of subclinical ruminal acidosis (less activity after the morning meal);
- alterations in the cohesion of groups of cows after the introduction of new animals, these being still not integrated into the social network two weeks after their introduction.

These results provide insights for managing animal welfare through precision livestock farming tools. Warnings could be provided to farmers when a welfare problem is detected in order to correct it quickly and welfare indicators could be calculated over a period of time to help estimate the level of well-being on a farm.

We continue the exploration of precision livestock farming tools to estimate the behaviour of animals: we aim at modelling daily variations of activity to be able to detect early the appearance of a disorder, exploring the use of brushes in relation to the welfare status of animals, studying the cohesion of social groups, in order to broaden the panel of animal welfare indicators. For this we collaborate with teams in mathematics and computer science from Clermont site (Limos) and the DigitAg convergence institute (Mistea).

Valorisation

Meunier, B., Pradel, P., Sloth, K. H., Cirie, C., Delval, E., Mialon, M.-M., Veissier, I. (2017). Image analysis to refine measurements of dairy cow behaviour from a real-time location system. *Biosystems Engineering*, 1-13. DOI: 10.1016/j.biosystemseng.2017.08.019

Veissier, I., Richard, M. M., Sloth, K. H. (2017). Early modification of the circadian organization of cow activity in relation to disease or estrus. *Journal of Dairy Science*, 100 (5), 3969-3974. DOI: 10.3168/jds.2016-11853

Veissier, I., Richard, M. M., Meunier, B., Silberberg, M., Nielsen, P., Blokhuis, H., Halachmi, I. (2017). Precision livestock farming and animal welfare: contradictions or synergies?. Presented at Annual Congress of the European Association for Animal Production, Tallinn, EST

Wagner, N., Antoine, V., Koko, J., Richard, M. M., Lardy, R., Veissier, I. (2018). Use of a precision-livestock-farming technology coupled with time series methods to identify abnormal circadian pattern of activity. Presented at Measuring behaviour, Manchester, GBR

Mialon, M. M., Silberberg, M., Meunier, B., Veissier, I. (2018). Precision livestock farming tools reveal behavioural modifications in ruminants under Sub-Acute Ruminal Acidosis (SARA). In: 10th. International Symposium on the Nutrition of Herbivores (ISNH10) (p. 389-389). *Advances in Animal Biosciences*, 9 (3).

Contact: Veissier Isabelle, isabelle.veissier@inra.fr, UMR Herbivores, F-63122 Saint-Genès-Champanelle, France.

