

Cow health monitoring: is rumination time really the gold standard?

International competitiveness and price-oriented consumer behaviour are the driving forces behind the increase in milking performance in dairy cows worldwide. Side effects of this development are diverse and involve amplified risk for various physiological, metabolic and immunological disorders.

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Thus, the stress increases between the conflicting goals of higher milking performance, on the one hand, and the maintenance of the health status of the herd, on the other. A lot, if not all disorders and diseases affect the individual feeding behaviour of ruminants and are accompanied by reduced dry-matter intake and decreased eating and rumination time. Even social stress can be linked to a decrease in time spent eating and ruminating, which is a direct response of ruminants to acute stressors.

Health problems have a negative impact on production in dairy herds and can lead to milk yield and quality reduction, increased mortality and veterinary treatment costs. Thus, consideration of eating behaviour is a high priority.

Monitoring daily eating and rumination time serves as a crucial and helpful parameter in gaining relevant information about the

individual animal and its ability to cope with farm-specific feeding, housing and management situations. The earlier changes are visible, the earlier individual counteractions can start.

Eating behaviour of ruminants is characterised by feed intake, chewing and rumination activity. In this regard, a multitude of different measurement methods exists to assess eating behaviour. Also, their stage of development and practical usage is different and their reliability is variable.

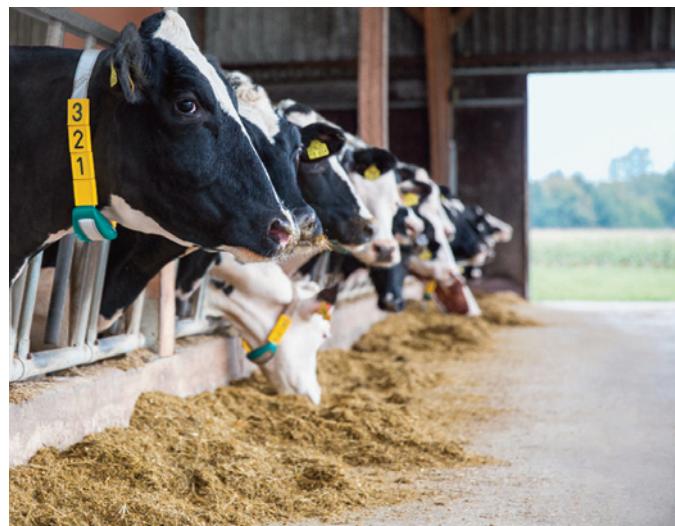
Methods for assessing rumination activity

For several decades, many scientists have been engaged in the development of functional and reliable methods to measure, assess and evaluate individual chewing and rumination activity of cattle and sheep.

Until a few years ago, individual rumination time was the primary measurement method of eating behaviour and it was successfully used as a basis for calculations and as an evaluation method for deviating behaviour.

The reason for this was that the development of functional, reliable and applicable methods to assess and evaluate individual rumination time was easier to realise than for comprehensive eating behaviour.

As rumination behaviour is a very uniform and easy to recognise behaviour pattern of a ruminant (Fig.



1), the development has focused quite early on this measurement parameter. Also, the development of reliable and valid algorithms was easier in comparison to the detection of eating behaviour which is an irregular and challenging behaviour pattern to recognise that differs from individual animal to individual animal even more (Fig. 2). The comparison of both feeding patterns makes this clear.

Therefore, a lot of literature and studies with according results and recommended actions exist mainly for rumination behaviour as an indicator for possible health issues or changed behaviour. The gold standard for heat detection and health management was born. But in

recent years progress has also been achieved within the development of algorithms to measure and assess irregular eating behaviour of ruminants. Thus, functional, reliable and applicable measurement methods for eating behaviour have arrived within the field of commercially usable Precision Dairy Farming systems as well. Since this development is only a short time ago, a lot of historical research was done with measurement systems for rumination time only. Literature about the meaningfulness of eating time as an early warning system for deviating behaviour is not so widespread yet. This is one of the main reasons why eating time is not usually considered as a useable

Fig. 1. Rumination phase.

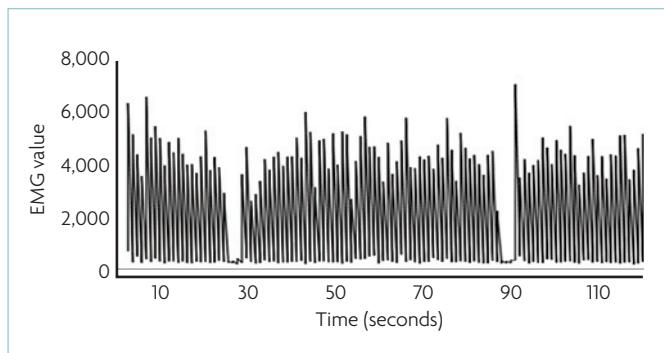
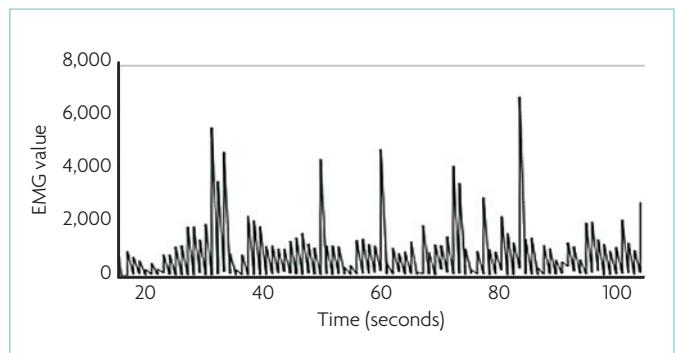


Fig. 2. Feed intake.



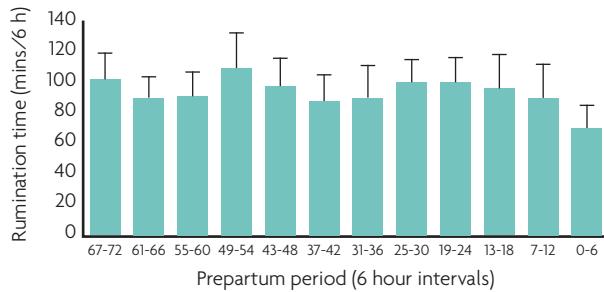


Fig. 3. Variance in rumination time of dairy cows (min/6 h) during the last 72 hours before the onset of calving (mean and SD; n=17).

indicator of suboptimal feeding conditions, altered behaviour or as a monitoring parameter for health management in general, in comparison to rumination time.

But is this view still justified? Is the consideration of rumination time as the gold standard in regards to heat and health monitoring not outdated in the meantime? The advantages of the meaningfulness of eating time are quite obvious, such as shown in these different examples.

Example 1

Lameness, initially, does not directly lead to a decrease of rumination activity. Depending on the severity of the lameness, only the frequency of visits to the feeding table are reduced. The total eating time of the day stays the same as fewer visits are

being compensated by longer eating periods per visit.

The identification of those minor changes depends on the analysis possibilities of the measurement method used. As a second step, taking into account the severity of the lameness, not only are the frequency of visits to the feeding table reduced, the total eating time of the day is also reduced.

With this change, an alarm can easily be generated by the used measuring system. Only in the third step, considering the temporal course, the rumination time is decreased because less feed was taken and the health condition in general is now poor for the cow. Thus, monitoring of eating time is the first choice in this scenario.

Example 2

Another example demonstrates the importance of measuring eating time as well as a stronger and more sensitive indicator for changed behaviour. The identification of the onset of birth is a crucial parameter for the prevention of dystocia.

Generally, the onset of birth is recognised by monitoring behaviour changes or external changes in the dam. Birth can also be monitored by measuring eating behaviour, such as eating time and rumination time. But

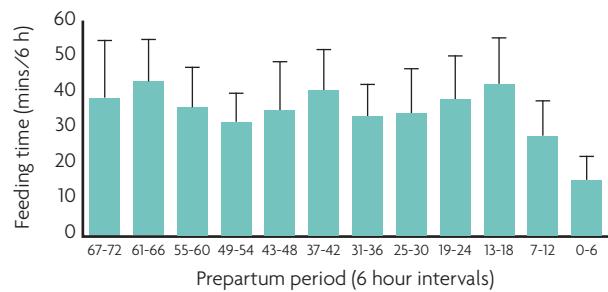


Fig. 4. Variance in eating time of dairy cows (min/6 h) during the last 72 hours before the onset of calving (mean and SD; n=17).

the sensitivity of both indicators is different.

Büchel & Sundrum, 2014 found out that an obvious decrease in both eating time and rumination time exists shortly before calving. Within this study the last 6 h before calving were compared with the 72- to 7-h time frame before calving. During the last 6 h before the onset of calving, feeding time was reduced by 57% on average (20.8 min/6h). Within the same time frame, rumination time was reduced by 27% on average (25.6 min/6h). With a decline twice as strong, eating time measurement is a more valuable indicator for predicting the onset of calving than rumination time measurement.

Example 3

The measurement of eating time also has decisive advantages with regards to the monitoring of husbandry conditions of dairy cows. A changed and inefficient animal/feeding place ratio can easily be identified by reduced eating time, which especially can be found within the low-ranking cows of the herd or group. As an immediate reaction, the eating time is reduced directly. However, rumination time is compensated for a certain period before a decline can be detected.

It becomes clear that the rumination time no longer represents the gold standard as a reliable method for early detection of possible health disorders, diseases or as an indicator for increased activity because of being in heat. Also, the measurement of individual eating time provides valuable information about the ruminant and can be used as a meaningful parameter and early warning system for behaviour changes with even more accuracy.

In the end, the farmer decides which measurement method and measuring system is the most useful and which parameters might have the biggest advantage for his/her farm management.

The development progress which has been achieved recently within the field of Precision Dairy Farming for health monitoring systems is tremendous. But not all available features and benefits that different measurement parameters offer are useful for every farmer.

The cost-benefit relation should always be a high priority for a successful farmer.

The farm should work closely with their service provider to learn more about the management possibilities of different cow monitoring systems, and how they can be used on their individual herd to help improve cow health and performance. ■