



# Rumination Monitoring White Paper

# Introduction

Rumination is a proven direct indicator of cow wellbeing and health. As such, dairy producers, veterinarians, and nutritionists alike have long relied on cud chewing as a key indicator of dairy cow health.

One of the primary purposes of rumination is to physically break down coarse material in food, in order to assist in its transfer from the rumen. An additional function is to increase the production of saliva, which acts as a buffer to the acids produced during the microbial degradation of carbohydrates. Dairy cows ruminate 8-9 hours a day (Adin 2009, Byskov 2015). A drop in rumination time can be a result of low feed intake or a direct disruption of rumen function.

Optimizing herd health, fertility, nutrition, and general management is the key to farm profitability – and in all these areas rumination can contribute useful information. Rumination monitoring can provide an early window for disease diagnosis, assessment of recovery and treatment effectiveness (Soriani 2015, Calamari 2014, Liboreiro 2016) or diagnosis of feed-related issues.

This document describes the advantages of rumination monitoring with Allflex management systems on the individual cow, group, and herd level.

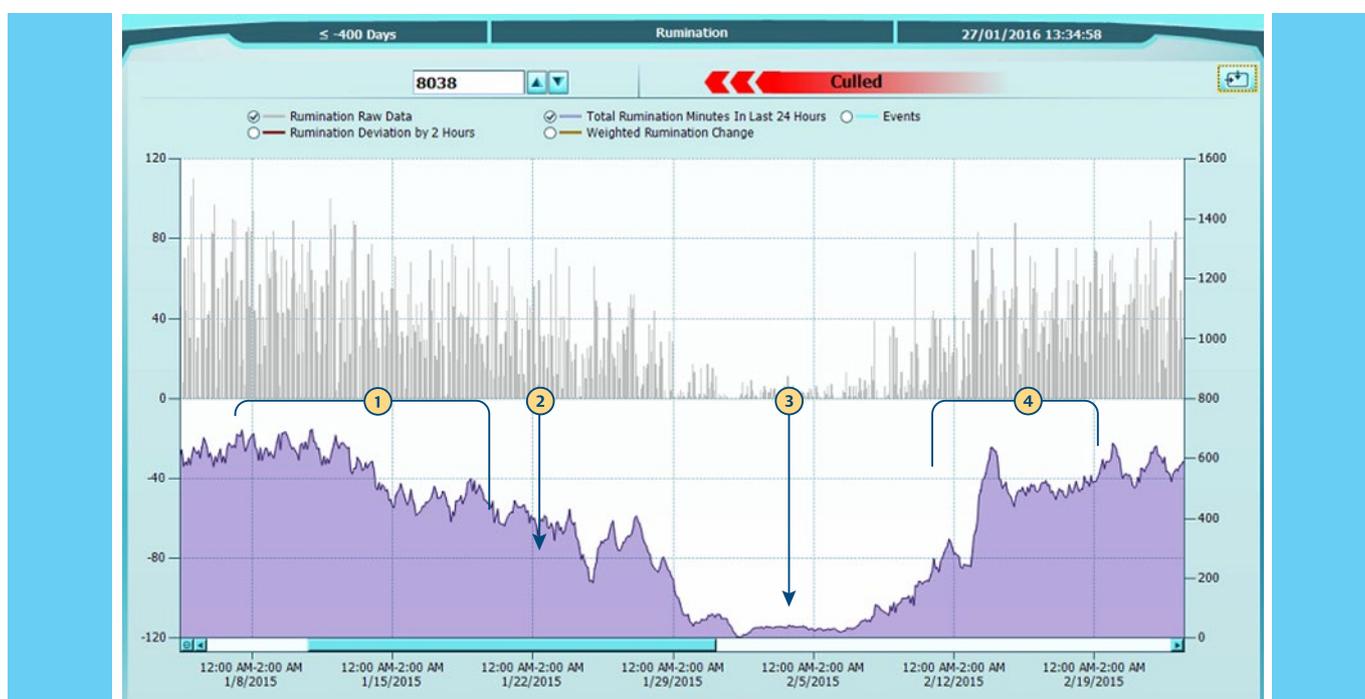


# Health Monitoring Using Rumination Time

## Early detection of disease

Early detection and prompt treatment of sick cows can minimize the detrimental effects on their production, reproduction, and overall wellbeing. Research shows that using the Allflex Health Report (which is based largely on rumination pattern analysis) enables the detection of disease several days before it is apparent to the dairy farmer (Stangaffero 2016).

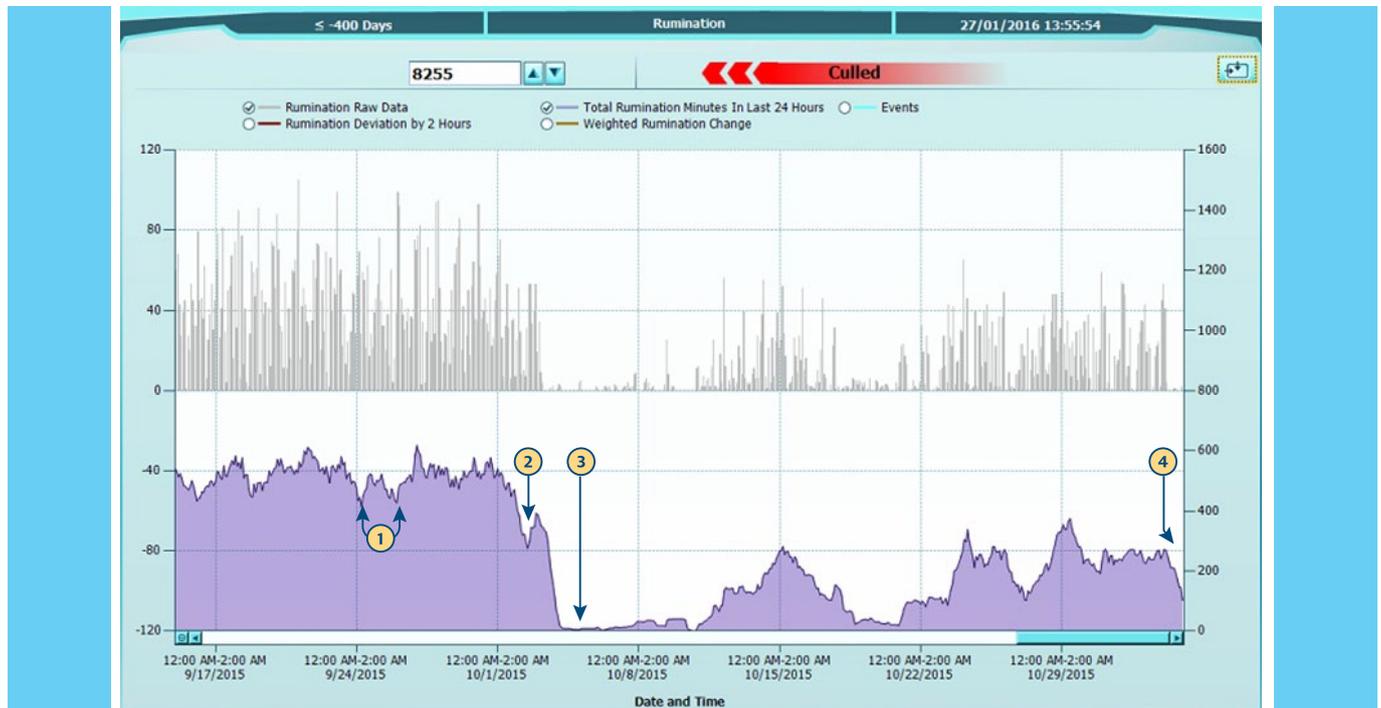
An example of a cow with mastitis is shown below. Rumination started to drop long before the farmer detected it in the milking parlor.



- 1 Cow slowly starts dropping in rumination before milk yield drops
- 2 1/25/15 Cow diagnosed with clinical mastitis and treated with antibiotics
- 3 2/8/15 Cow starts recovering
- 4 2/24/15 Cow returns to normal levels of rumination

## Easy recovery follow up

Rumination is essential for the cow. As such, her rumination will return to normal levels before her production level returns to normal. This means that rumination monitoring provides a more immediate way to evaluate the effectiveness of treatment. An example of a cow with clinical mastitis is given below. After the cow was treated, rumination started rising. Notice how the recovery in this case is poor, indicated by the uneven and low level of rumination.

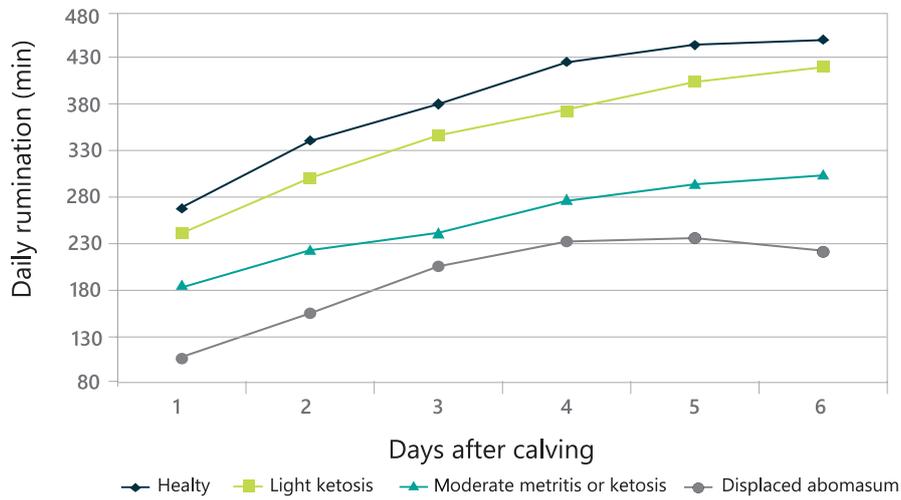


- 1 Cow slowly starts dropping in rumination before milk yield drops
- 2 1/25/15 Cow diagnosed with clinical mastitis and treated with antibiotics
- 3 2/8/15 Cow starts recovering
- 4 2/24/15 Cow returns to normal levels of rumination

## Fresh cow monitoring

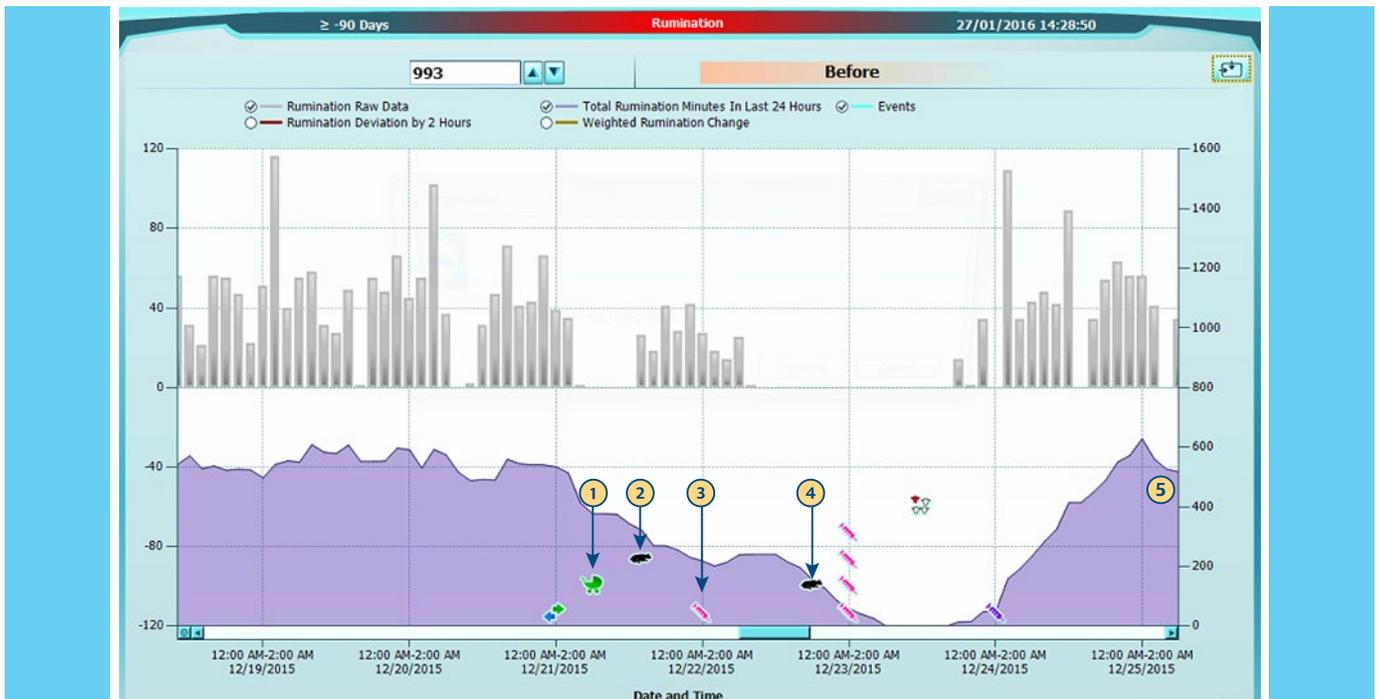
The cow's wellbeing in the first days after calving dictates the fate of her health and productivity for the entire lactation. Cows with low feed intake in these critical days will suffer from various calving diseases (such as metritis and ketosis) later on, with a detrimental effect on future production and reproduction (Calamari 2014, Soriani 2015, Liboreiro 2016).

The next graph shows the daily rumination time of healthy and (later diagnosed) sick cows in the first week after calving. Cows with low rumination levels in this period appear on the Allflex Health Report, enabling the farmer to concentrate on these cows and promptly respond before clinical diseases develop.



### Real-time alerts in distress situations

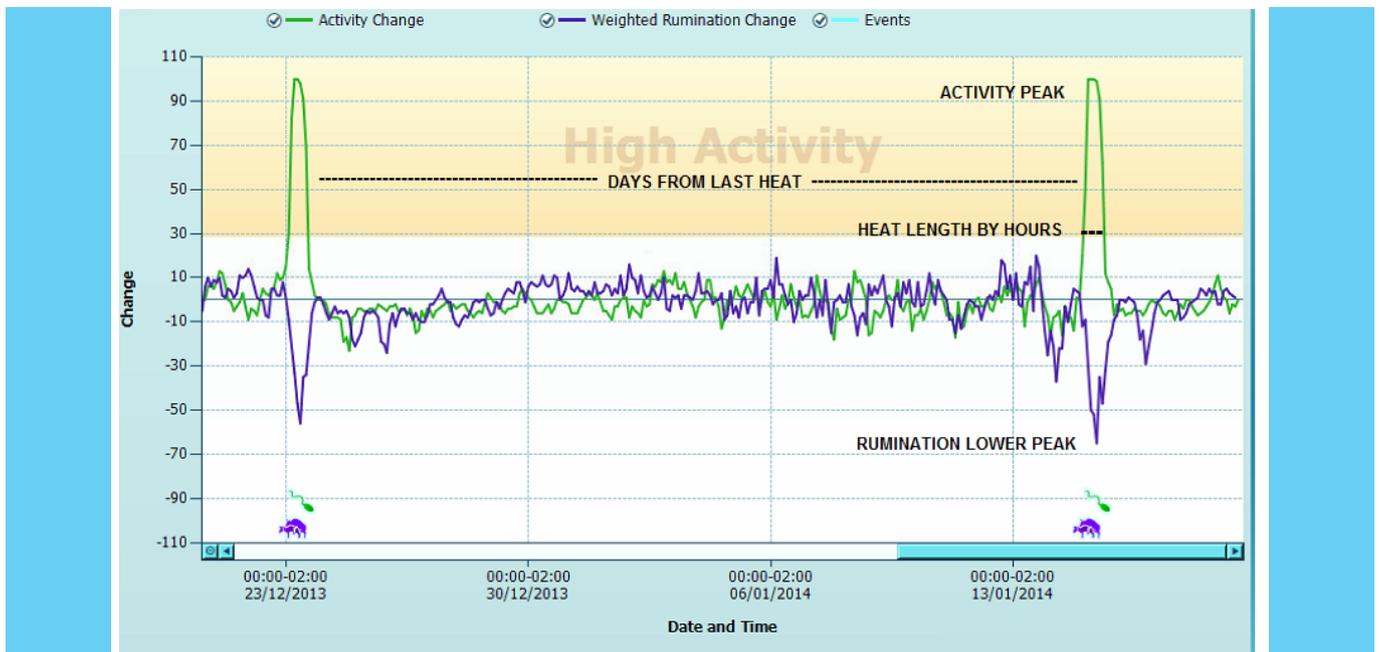
Cows ruminate in numerous sessions throughout the day. A pause in rumination of a few hours is a rare situation. If a cow stops ruminating for a long period of time, she is probably suffering from an acute situation that requires the farmer to react immediately, before fatal consequences occur. In order to protect the cow's wellbeing, the Allflex system sends a distress alert to the farmer as soon as distress occurs. The next figure shows the rumination pattern of a cow suffering from milk fever after calving, and the relevant alerts noted by the system.



- 1 12/21/15. 6:30 AM Cow calved; delivered twins
- 2 12/21/15 2:00 PM Post-calving distress alert was sent to the farmer
- 3 12/22/15 Cow treated for fever and retained fetal membranes
- 4 12/23/15 Second Post-calving distress alert sent; cow needed more attention
- 5 Cow recovers

## Heat detection

The vast majority of cows in estrus will have a drop in their rumination level (Stangaffero 2016). The Allflex Heat Index uses this rumination information in the calculation of the cow's individual heat index, thus improving on the efficiency of heat detection based on activity levels alone. The next figure displays the typical relationship between rumination and activity on the day of estrus.



## Nutrition

The trigger for the cow to start ruminating is rumen fill. The part of the feed that contributes to the rumination process is the long fiber part of the ration (Mertents 1997). During the rumination process the long fiber of the ration is broken down, enabling the rumen bacteria to digest the fiber. Rumination time is proportional to the amount of long fiber that the cow has eaten. Cows will ruminate about 140 minutes per 1 kg of long fiber consumed. As such, changes in ration content and/or the ration's physical characteristics will be reflected in rumination time changes (Adin 2009).

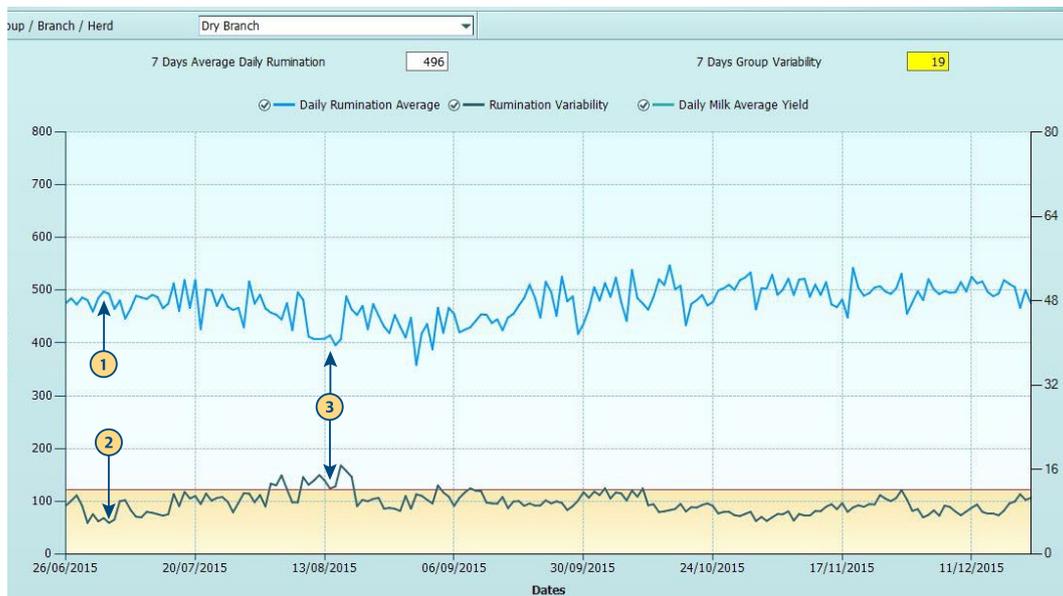
In a typical dairy, feed and feeding management is usually very consistent. When a steady feeding schedule is maintained, one can expect a consistent rumination level on the group or herd level. Once a constant level of rumination is established, any exceptions will indicate that there is a problem either with the ration itself, or with the feed management on the farm.

Daily rumination time of less than 400 minutes per day is considered low rumination, and is a major indicator or risk factor for rumen acidosis, due to less saliva production and insufficient rumen buffer (DeVries 2009). Rumen acidosis seriously impairs a cow's health and welfare, and farmer income.

The Allflex Group Consistency graph gives the farmer an easy way to monitor feed consistency and identify deficiencies in feed bunk space, water trough space, or laying down opportunities due to overstocking. Using the Allflex system, farmers can monitor not only milking cows, but also dry cows and replacement heifers.

In addition to monitoring rumination trends in both the short and long-term through the graph, the calculated Last Week group standard deviation is a useful performance indicator for optimizing feed efficiency. Lower variability values reflect more stable rumen flora, which is essential for optimal nutrient digestibility.

In the graph below, the group rumination standard deviation (the lower line) reflects how variable the cows are in their daily rumination. Biological rumination standard deviation is typically 50-80 minutes/day. Whenever one of the resources (like feed bunk space) is less than optimal, some cows (those that are lower ranked) will not adequately eat, drink or lay down, causing the variability to increase substantially, as seen below in the beginning of August.



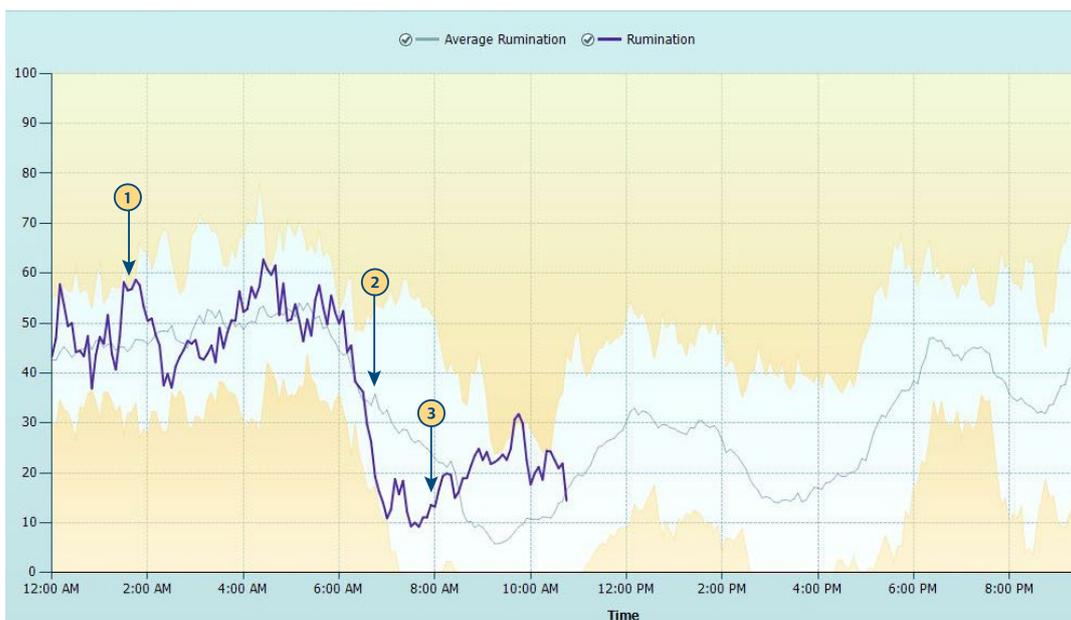
- 1 Group rumination average
- 2 Within the norms of group rumination variability
- 3 Group overstocking caused both a drop in group rumination and high variability in the group

## Management

Keeping a consistent schedule on the farm is essential for optimizing feed efficiency and cows' wellbeing.

For example, late feeding can cause rumen acidosis even with an apparently balanced ration (because hungry cows will consume more concentrate in the same eating session). The Allflex Routine Monitoring report enables the farmer to track the farm's routine in real time, and be alerted when a large deviation from the norm is detected (for example in case of cow theft).

The next figure displays the normal farm rumination routine. On this day, feed was delivered two hours earlier than usual, causing more cows to be at the feed bunk, instead of ruminating, between 6:30 AM and 8:30 AM.



- 1 Current group rumination
- 2 Group rumination average of the previous weeks
- 3 Notice the drop in group rumination due to the change in the feed's delivery time

## Bibliography:

- Adin, G., R. Solomon, R. M. Nikbachat, A. Zenou, E. Yosef, A. Brosh, A. Shabtay, S. J. Mabjeesh, I. Halachmi, and J. Miron. 2009. Effect of feeding cows in early lactation with diets differing in roughage-neutral detergent fiber content on intake behavior, rumination, and milk production. *J. Dairy Sci.* 92:3364-3373.
- Byskov, M. V., E. Nadeau, B. E. O. Johansson, and P. Nørgaard. 2015. Variations in automatically recorded rumination time as explained by variations in intake of dietary fractions and milk production, and between-cow variation. *J. Dairy Sci.* 98:3926-3937.
- Calamari, L., N. Soriani, G. Panella, F. Petrera, A. Minuti, and E. Trevisi. 2014. Rumination time around calving: an early signal to detect cows at greater risk of disease. *J. Dairy Sci.* 97:1-13.
- DeVries, T. J., K. A. Beauchemin, F. Dohme, and K. S. Schwartzkopf-Genswein. 2009. Repeated ruminal acidosis challenges in lactating dairy cows at high and low risk for developing acidosis: Feeding, ruminating, and lying behavior. *J. Dairy Sci.* 92:5067-5078.
- Kaufman, E.I., S. J. LeBlanc, B. W. McBride, T. F. Duffield, and T. J. DeVries. 2016. Association of rumination time with subclinical ketosis in transition dairy cows. *J. Dairy Sci.* 99:5604-5618.
- Liboreiro, D. N., K. S. Machado, P. R. B. Silva, M. M. Maturana, T. K. Nishimura, A. P. Brandao, M. I. Endres, and R. C. Chebel. 2015. Characterization of peripartum rumination and activity of cows diagnosed with metabolic and uterine diseases. *J. Dairy Sci.* 98: 6812-6827.
- Mertens, D. R. 1997. Creating a system for meeting the fiber requirements of dairy cows. *J. Dairy Sci.* 80:1463-1481.
- Pahl, C., E. Hartung, K. Mahlkow-Nerge, and A. Haeussermann. 2015. Feeding characteristics and rumination time of dairy cows around estrus. *J. Dairy Sci.* 98:148-154.
- Stangaferro, M. L., R. Wijma, L. S. Caixeta, M. A. Al-Abri, and J. O. Giordano. 2016. Use of rumination and activity monitoring for the identification of dairy cows with health disorders: Part I. Metabolic and digestive disorders. *J. Dairy Sci.* 99:1-16.
- Soriani, N., E. Trevisi, and L. Calamari. 2012. Relationships between rumination time, metabolic conditions and health status in dairy cows during the transition period. *J. Anim. Sci.* 90:4544-4554.
- Sova, A. D., S. J. LeBlanc, B. W. McBride, and T. J. DeVries. 2014. Accuracy and precision of total mixed rations fed on commercial dairy farms. *J. Dairy Sci.* 97:562-571.

[www.allflex.global](http://www.allflex.global) | [info@scrdairy.com](mailto:info@scrdairy.com)

Allflex Livestock Intelligence, part of MSD Animal Health, is the world leader in the design, development, manufacturing and delivery of solutions for animal identification, monitoring and traceability. Our solutions empower farmers to act in a timely manner, to safeguard their animals' health, while achieving optimal production outcomes for a healthy food supply.

Through its commitment to the Science of Healthier Animals®, MSD Animal Health offers veterinarians, farmers, pet owners and governments one of the widest ranges of veterinary pharmaceuticals, vaccines and health management solutions and services. MSD Animal Health is dedicated to preserving and improving the health, well-being and performance of animals and the people who care for them.

Copyright© 2019 SCR Engineers Ltd., subsidiary of Merck & Co., Inc., Kenilworth, New Jersey, U.S.A. The information contained herein is subject to change without notice. The only warranties for SCR's products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. SCR shall not be liable for technical or editorial errors or omissions contained herein.



Livestock Intelligence

Rum\_8\_A4\_Eng\_July19