

MEDIA INFORMATION

Leibniz Institute for Farm Animal Biology

Dummerstorf, November 3, 2020



LEIBNIZ INSTITUTE
FOR FARM ANIMAL BIOLOGY

Animal Health: Scientists in Dummerstorf develop early warning system for pregnant dairy cows

Proposed new metabolic stability parameter as a EU patent

In the period around birth, high yielding dairy cows are exposed to strong metabolic strains. Among other things, this can lead to impairment of the immune system with increased susceptibility to disease as well as a reduction in performance and well-being. Scientists at the Leibniz Institute for Farm Animal Biology Dummerstorf (FBN) have succeeded for the first time in identifying a physiological marker that allows reliable predictions on the metabolic stability of dairy cows. This research success by PD Dr. Monika Röntgen and Dr. Sandra Erdmann has now been recognised as a European patent*.

The patent is based on innovative studies of heart rate variability (HRV) in high yielding dairy cows, funded by the German Research Foundation (DFG). "Up to now, there are no reliable parameters in dairy cow husbandry that allow a predictive statement on the development of their health after calving", said study leader PD Dr. Monika Röntgen. "The non-invasive determination of a single parameter now makes it possible to identify dairy cows with good metabolic stability, high food intake and milk yield as well as those with reduced metabolic stability and increased risk of disease as early as four weeks before calving. With our parameter, we have laid a scientific foundation to more effectively balance the three important pillars of health, animal welfare and performance in the future".

Threshold value marks health hazard

It has been shown that there is a high variability in the adaptability of dairy cows to metabolic stress. In contrast to risk animals, other animals can deal much better with this metabolic stress, adapt more quickly with targeted regulatory processes and remain healthy and productive. "We have therefore looked for parameters, biomarkers and methods with which these groups can be differentiated at an early stage, i.e. already during pregnancy. The early detection of high-risk cows allows preventive measures in herd management and is therefore an important factor in increasing animal welfare," the veterinarian said.

Up to now, a large number of influencing variables such as metabolic parameters, inflammation factors and hormones have been used to determine the body condition of cows in early lactation (milk production). They reflect the current condition of the animals and allow the diagnosis of existing diseases, but are not suitable as an early warning system to describe the cows' ability to

adapt to metabolic requirements. The physical adaptation of cows required after calving is achieved through the interaction of a variety of regulatory mechanisms, with hormones and the autonomic nervous system playing an important role. After recording electrocardiograms (ECG curves), the activity of the autonomic nervous system can be determined by mathematical analysis of heart rate variability (HRV).

"We have found that cows with normal or reduced metabolic stability clearly differ in the expression of the non-linear HRV parameter Maxline (Lmax)," says Röntgen. Another decisive advantage in contrast to other cardiac data is the independence of the parameter from current influences such as the metabolic situation or the cows' activity of movement.

"The scientifically based Lmax threshold will provide farmers with a tool to anticipate and take preventive action in case of pregnant cows with increased stress levels and disease risk. This will also make it possible to significantly reduce economic risks caused by treatment costs, loss of performance and reduced fertility".

Outlook - where do we go from here?

In a next step, a larger field study will test the practical introduction of the system in dairy cattle farming. For this purpose, the heart rate will be recorded with a specially developed cattle belt with electrodes and transmitter, which has been designed during the test series at FBN, and will be transmitted to a standard evaluation unit. An evaluation software calculates the individual Lmax value of the corresponding dairy cow and then compares it with the Lmax threshold value. The cattle owner then receives the information about the group assignment.

For the future, automated data acquisition via sensors is planned. Furthermore, the method can be used to improve herd health and breeding strategy in the long term by typing and selecting female animals with stable autonomous regulatory capacity and thus high metabolic stability. "Our scientific results show that such cows in early lactation also show lower stress levels, higher food intake and better milk yield," the scientists emphasised.

Photos: FBN

PD Dr. Monika Röntgen sees the new parameter as a reliable value for the well-being of dairy cows even before the calf is born. The heart rates of dairy cow Sunny were recorded and evaluated using a belt.

***Patentnummer: EP 3459446, PVA7128, Status 2020/08**

Methode zur prädiktiven Identifizierung von Milchkühen mit reduzierter regulativer Kapazität und erhöhtem Krankheitsrisiko als Antwort auf Stoffwechselstress
(METHOD FOR IDENTIFYING A FARM ANIMAL HAVING AN IMPAIRMENT OF REGULATIVE CAPACITY IN RESPONSE TO METABOLIC STRESS)

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Leibniz-Institut für Nutztierbiologie (FBN)

Vorstand Prof. Dr. Klaus Wimmers

T +49 38208-68 600

E wimmers@fbn-dummerstorf.de

Institut für Muskelbiologie und Wachstum

Leitung Prof. Dr. Steffen Maak

T +49 38208-68 850

E maak@fbn-dummerstorf.de

Abteilung Wachstum und Entwicklung

Leitung PD Dr. Monika Röntgen

T +49 38208-68 682

E roentgen@fbn-dummerstorf.de

Wissenschaftsorganisation Dr. Norbert K. Borowy

T +49 38208-68 605

E borowy@fbn-dummerstorf.de

www.fbn-dummerstorf.de