

MEDIA INFORMATION

Leibniz Institute for Farm Animal Biology

Dummerstorf, June 23, 2020



LEIBNIZ INSTITUTE
FOR FARM ANIMAL BIOLOGY

Effects of heat stress in cattle, resources-saving breeding and improvement of animal welfare

FBN has been cooperating with Brazilian scientists for almost a decade

Scientists at the Leibniz Institute for Farm Animal Biology Dummerstorf have been cooperating with Brazilian biologists and veterinarians since 2011 to develop sustainable strategies for improving the metabolic stability and productive life of cattle and their husbandry conditions against the background of climate change. The influence of heat stress on fertility, oocyte and embryonic development and energy metabolism in early embryos is being researched in various projects.

"The close cooperation and networking with the Brazilian colleagues has not only led to a number of important findings, but also promoted a lively exchange with students and junior scientists," emphasized Dr. Ralf Pöhland of the FBN Institute of Reproductive Biology. Since July 2019, Professor Dr. Fabiana de Andrade Melo Sterza from the State University of Mato Grosso do Sul in Aquidauana (UEMS/Brazil) has been working as a visiting scientist at FBN. Since 2011, the veterinary surgeon has been in charge of research cooperation and exchange of scientists for Brazil.

"Agriculture is an important sector for the Brazilian economy, especially in the state of Mato Grosso do Sul in the midwest of Brazil. The region of Mato Grosso do Sul is as large as Germany, but with a population of 2.67 million it has far fewer inhabitants and, with 21.4 million animals, far more cattle," Professor Fabiana de Andrade Melo Sterza made clear. "The use of innovative biotechnologies and biomarkers in breeding can promote the production of milk and meat while reducing the consumption of land and resources, avoiding environmental damage and improving animal welfare. Despite intensive research on fertility and productive life, results in this field have been stagnating for several years. With the modern research equipment and the know-how of the FBN, we would like to achieve further successes in this field"

A hot climate affects cattle farming

For many years, scientists have been researching the consequences of increasing heat periods on the metabolism and fertility of dairy cows. Similar to humans, cows breathe and sweat more at high temperatures and absorb more water than at their comfort temperature. In German dairy cattle, this temperature is around four to 15 degrees Celsius. From around 20 degrees Celsius, the animals have to spend additional energy to regulate their body temperature. Tropical breeds are more adapted to higher temperatures.

Within the framework of German-Brazilian cooperation, several research projects are investigating how heat affects tropical cattle breeds established in Brazil under different husbandry conditions and what natural adaptation mechanisms these breeds have developed.

The focus is on the white beef cattle Nelore, which originally derives from the Indian zebu and is well adapted to the hot climate, and the Girolandos, which are kept as dairy cattle throughout Brazil. The third breed are the nearly wild Pantaneiros, which are threatened with extinction and are used to high temperatures and humidity.

Research results receive great attention in Brazil

"Among other things, we were able to prove that the Pantaneiros, unlike the Girolandos, hardly react to heat stress caused by very high temperatures and humidity. Respiration frequency remained unchanged, while the Girolandos react to heat stress in a similarly negative way as the German cattle," says Professor Dr. Fabiana de Andrade Melo Sterza. "What was new for us was that the Pantaneira cows showed comparable symptoms to other cattle under heat stress in some parameters under low temperatures. We want to investigate this further."

Another important finding was the positive effects on the husbandry system. "Shady animal husbandry in forest areas resulted in improved fertility and early embryonic development after artificial insemination, even in the heat-resistant Nelore cattle."

Brazil is currently the largest meat producer and exporter as well as the second largest embryo producer in the world. Animal welfare and environmental protection play an increasingly important role. Last year the climate neutral meat seal (Brazilian beef - carbon neutral) was established in Brazil. Farmers who use integrated and low-emission husbandry systems in forests for their cattle can use the seal in their marketing. EMBRAPA Campo Grande, another joint Brazilian partner, is particularly active in this area.

To improve the conditions under which cattle are kept, more and more cattle breeders are also focusing on stress-free handling, which livestock farmers call "Manejo Nada na mãos". This stands for "nothing in the hands" and a new practice of herd management using speech and body control.

Joint research will continue

The cooperation with the experts from Brazil will be continued in several projects. "First of all, the focus is on the strategies of adaptation to the environment and climate that have emerged during the domestication and breeding of the breeds studied under the correspondingly different conditions. Breeding strategies and husbandry recommendations are to be derived from this. In the future, the researchers hope to identify reliable markers, i.e. concrete, easily measurable genetic traits, which will provide solutions for improving animal welfare and health even under heat stress," said Dr. Ralf Pöhland. "Here we are pursuing several promising approaches that have emerged from almost ten years of research cooperation."

Heat stress in farm animals is a research focus at the Leibniz Institute for Farm Animal Biology Dummerstorf (FBN). The Dummerstorf Institute has climate and respiration chambers in which research can be carried out under state-of-the-art conditions and with almost any desired temperature and humidity. On the one hand, this is of importance for the high-yielding dairy cows,

which often suffer from heat stress during the German summer, and on the other hand, it is also important for the improvement of livestock farming in southern countries, particularly in view of climate change.

Publications

Tropical Animal Health and Production; March 2020

Shading effect on physiological parameters and in vitro embryo production of tropical adapted Nelore heifers in integrated crop-livestock-forest systems

<https://link.springer.com/article/10.1007/s11250-020-02244-3>

DOI <https://doi.org/10.1007/s11250-020-02244-3>

Theriogenology; May 2019

Oocyte Quality and Heat Shock Proteins in Oocytes From Bovine Breeds Adapted to the Tropics Under Different Conditions of Environmental Thermal Stress

<https://pubmed.ncbi.nlm.nih.gov/30878692/>

DOI: 10.1016/j.theriogenology.2019.02.039

Photos 1-3: Ralf Pöhland/FBN

Photo1

Partner in Brazil - farmer Cláudio Zotesso (left) with Prof. Dr. Fabiana de Andrade Melo Sterza and Dr. Ralf Pöhland on a cattle farm.

Photo2

Prof. Dr. Fabiana de Andrade Melo Sterza in the Dummersdorf cytometry laboratory working at the laser scanning microscope.

Photo3

Dr. Ralf Pöhland and Prof. Fabiana de Andrade Melo Sterza (front row middle) with the Brazilian students and PhD students who are working on the project at the institute in Aquidauana.

Photos 4: Kadijah Suleiman

Photo4

The German-Brazilian research project focuses, among other things, on the light-skinned Nelore cattle, the predominant beef cattle breed in Central Brazil. The project is investigating the advantages of keeping animals in shady forests.

The Leibniz Association

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