

MEDIA INFORMATION

Leibniz Institute for Farm Animal Biology

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LEIBNIZ INSTITUTE
FOR FARM ANIMAL BIOLOGY

What makes Cow, Pig & Co tick?

Chronobiology – a Swedish scientist and his team want to research the “internal clock” in livestock

It is actually invisible, but at the daylight saving time change in summer many people’s “internal” clock goes haywire, with sleep disturbances, bad academic performance and general malaise as some of the consequences. Since 1980 clocks in Europe and other parts of the world have been set one hour ahead in March and turned back in October. The science of chronobiology was still in its infancy at that time. In the meantime chronobiology, which is concerned with the temporal organisation of biological systems, has been established and is on everyone’s lips. The regularities and rhythmically recurring factors in their ways of life are already very well investigated in mice and humans. Most body processes, such as sleep, hormone production, metabolism, and brain function, follow a daily rhythm. A team led by the Swedish scientist Dr. Pål Westermark now also wants to investigate the internal clock of farm animals. What makes Cow, Pig & Co tick and what effects do certain life processes and living conditions have on the wellbeing of the animals?

Dr. Pål Westermark describes himself as a “light owl”, possibly because he was brought up like that by his own father. Chronobiology distinguishes between early and late types. The early type, the lark, is very active in the morning, whereas the owl as late type prefers evenings. This basic orientation affects people when the time changes, with late types suffering more from this artificial intervention in our daily routine. The 43-year-old has been researching typical behaviour and physiological processes in mice whose life cycles are influenced in different ways for twelve years, since 2005 at Humboldt University and Charité in Berlin and since November 2016 at the Leibniz Institute for Farm Animal Biology (FBN).

“The internal clock has a far greater significance than previously assumed – we are gaining new knowledge all the time”, says Dr. Pål Westermark. “Every cell contains a symbolic little clock that works as reliably as an electronic system. That’s why in Berlin we worked together with physicists, among others, in order to understand this internal clockwork better”, continues the biophysicist. “External circumstances have an enormous effect on our internal clock, which in turn influences the immune system and practically all life functions to a more or less significant extent. It’s clear that an internal clock ticks away in every mammal and probably in every living being.” Research on, among other things, fruit flies and plants, has yielded the same result, and their inner clocks are now well understood.

Knowing what is good for animals

After twelve years of basic research in chronobiology the Uppsala-born and Stockholm-raised scientist now wants to go onto the next step at the Dummerstorf Institute. “We are currently preparing to research bovine biorhythms at FBN”, Westermark explains. Pigs will also be included in this research at a later stage. There are only a few research groups in the world that investigate chronobiological processes in livestock. “The science is still at a very early stage.”

The collected data will be evaluated and the internal clock “measured” using statistical methods and methods currently being developed at the Institute of Genetics and Biometry. How do different life rhythms affect the cow's physical functions, performance and well-being? This mainly relates to light, eating habits, stress and resting conditions, regeneration during sleep, noise and stable design. “For us it’s also about identifying the individual genetic and hereditary

causes”, according to Westermark. “Our vision is to find out what the internal clock means for the basic wellbeing of the animals. This also has immensely important consequences for human biology.”

Background

The Department of Bioinformatics and Biomathematics at the FBN Institute of Genetics and Biometry develops statistical and mathematical models as well as software for the purpose of analysing genetic information and data. The main focus is on research of the molecular basis of farm animals, as well as mechanisms of the internal clock in animals and aging processes.

Circadian rhythms and metabolism

In February 2017 Dr. Pål Westermark, together with other scientists, published a study on the effects of circadian rhythms on the metabolism of mice in the renowned American Journal PNAS. PNAS is one of the world's largest multidisciplinary journals, publishing more than 3,100 major research projects annually.

*“Principles for circadian orchestration of metabolic pathways”

<https://doi.org/10.1073/pnas.1613103114>

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Extensive research has already been done on the “internal clock” in humans and mice. Dr. Pål Westermark, here with a Dummerstorf laboratory mouse, has been doing research on what wakes mice up and what makes them feel good for many years.

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