



ELSEVIER



## FOR IMMEDIATE RELEASE

### Media contacts:

Eileen Leahy

Elsevier

+1 732 238 3628

[jdsmedia@elsevier.com](mailto:jdsmedia@elsevier.com)

### Ken Olson, PhD, PAS

American Dairy Science Association®

+1 630 237 4961

[keolson@prodigy.net](mailto:keolson@prodigy.net)

## Study examines disruption of circadian rhythm in dairy cows as risk factor for decreased insulin sensitivity, mammary development, and milk yield

*Maintaining consistency in day-to-day activities and environment is important for dairy cows during late gestation, according to a study published in Journal of Dairy Science®*

**Philadelphia, January 14, 2021** – Anyone who has ever suffered from jet lag knows you can't disrupt your normal sleep schedule without physiological effects. New research in lactating dairy cattle demonstrates that changing natural circadian rhythms can cause decreased mammary development and increased insulin resistance, which may lead to lower subsequent milk yield. The research, presented in the [Journal of Dairy Science](#), is helping scientists better understand how circadian and metabolic systems are connected and mutually managed.

The highest rate of metabolic disease in dairy cattle happens in the period at the end of gestation and for the first few months after delivery. In mammals, the circadian timing system is composed of multiple clocks. The master clock is located in the suprachiasmatic nuclei of the hypothalamus, and regulates the timing of peripheral clocks across the body. Changes in the timing of temporal cues in an animal's environment disturb daily physiological and behavioral cycles and are linked to negative changes in metabolic systems that can affect health in rodents and humans.

"This work indicates that the circadian timing system plays a role in the regulation of glucose homeostasis and mammary development in cattle and shows the importance of minimizing disturbances in day-to-day activities and environment of cattle and maintaining consistency during late gestation to ensure optimal milk production in early lactation," said author Theresa Casey, PhD, Department of Animal Sciences, Purdue University.



Caption: A new study published in the *Journal of Dairy Science* examines disruption of circadian rhythm as risk factor for decreased insulin sensitivity, mammary development, and milk yield of dairy cows (Credit: iStock.com/Clara Bastian).

Casey and her colleagues exposed Holstein cows to 16 hours of light and 8 hours of darkness, with the light cycle shifting 6 hours every 3 days, starting 35 days before the animals were expected to calve. After five weeks of exposure, cows in late pregnancy exhibited increased insulin resistance and reduced mammary development compared with the control group. The researchers found that the effects carried over into the postpartum period, after the treatment was eliminated, and cows had reduced milk yield and decreased insulin sensitivity.

Because major shifts occur in how dietary energy is directed to support fetal growth and milk synthesis during the transition from late gestation to early lactation, this is the most metabolically demanding time for dairy cattle. The scientists zeroed in on the levels of blood glucose, insulin, nonesterified fatty acids, and  $\beta$ -hydroxybutyrate, which are the markers for changes in plasma metabolite and hormone levels that reflect physiological changes in response to increased metabolic demands.

Jacquelyn Boerman, PhD, Department of Animal Sciences, Purdue University, added, "Dairy farm management systems need to consider approaches that minimize the potential of circadian system disruption for the benefit of cattle health and production."

Research was supported by the Agriculture and Food Research Initiative competitive grant from the USDA National Institute of Food and Agriculture.

---

#### **Notes for editors**

The article is "Chronic prepartum light-dark phase shifts in cattle disrupt circadian clocks, decrease insulin sensitivity and mammary development, and are associated with lower milk yield through 60 days

postpartum,” by C.J. McCabe, A. Suarez-Trujillo, K.A. Teeple, T.M. Casey, and J.P. Boerman (<https://doi.org/10.3168/jds.2020-19250>). It appears in the *Journal of Dairy Science*, volume 104, issue 2 (February 2021), published by FASS Inc. and [Elsevier](#).

The article is openly available at [www.journalofdairyscience.org/article/S0022-0302\(20\)31040-7/fulltext](http://www.journalofdairyscience.org/article/S0022-0302(20)31040-7/fulltext).

Journalists wishing to interview the authors should contact the corresponding authors, T.M. Casey ([theresa-casey@purdue.edu](mailto:theresa-casey@purdue.edu)) or J.P. Boerman ([jboerma@purdue.edu](mailto:jboerma@purdue.edu)).

### **About the *Journal of Dairy Science***

The *Journal of Dairy Science*® (JDS), an official journal of the American Dairy Science Association®, is co-published by Elsevier and FASS Inc. for the American Dairy Science Association. It is the leading general dairy research journal in the world. JDS readers represent education, industry, and government agencies in more than 70 countries, with interests in biochemistry, breeding, economics, engineering, environment, food science, genetics, microbiology, nutrition, pathology, physiology, processing, public health, quality assurance, and sanitation. JDS has a 2019 Journal Impact Factor of 3.333 and 5-year Journal Impact Factor of 3.432 according to Journal Citation Reports (Source: Clarivate 2020).

[www.journalofdairyscience.org](http://www.journalofdairyscience.org)

### **About the American Dairy Science Association (ADSA)**

The American Dairy Science Association (ADSA) is an international organization of educators, scientists, and industry representatives who are committed to advancing the dairy industry and keenly aware of the vital role the dairy sciences play in fulfilling the economic, nutritive, and health requirements of the world's population. It provides leadership in scientific and technical support to sustain and grow the global dairy industry through generation, dissemination, and exchange of information and services. Together, ADSA members have discovered new methods and technologies that have revolutionized the dairy industry.

[www.adsa.org](http://www.adsa.org)

### **About Elsevier**

As a global leader in information and analytics, [Elsevier](#) helps researchers and healthcare professionals advance science and improve health outcomes for the benefit of society. We do this by facilitating insights and critical decision-making for customers across the global research and health ecosystems.

In everything we publish, we uphold the highest standards of quality and integrity. We bring that same rigor to our information analytics solutions for researchers, health professionals, institutions and funders.

Elsevier employs 8,100 people worldwide. We have supported the work of our research and health partners for more than 140 years. Growing from our roots in publishing, we offer knowledge and valuable analytics that help our users make breakthroughs and drive societal progress. Digital solutions such as [ScienceDirect](#), [Scopus](#), [SciVal](#), [ClinicalKey](#) and [Sherpath](#) support strategic [research management](#), [R&D performance](#), [clinical decision support](#), and [health education](#). Researchers and healthcare professionals rely on our 2,500+ digitized journals, including [The Lancet](#) and [Cell](#); our 40,000 eBook titles; and our iconic reference works, such as *Gray's Anatomy*. With the [Elsevier Foundation](#) and our external [Inclusion & Diversity Advisory Board](#), we work in partnership with diverse stakeholders to advance [inclusion and diversity](#) in science, research and healthcare in developing countries and around the world.

Elsevier is part of [RELX](#), a global provider of information-based analytics and decision tools for professional and business customers. [www.elsevier.com](http://www.elsevier.com)

