FACULTEIT DIERGENEESKUNDE
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UNIVERSITEIT GENT

INVITATION EVENT

Sleep in farm animals

December 5th 2023

'Meet the PhD jury' lecture by dr. Emma Ternman

Sleep in cattle – an ongoing challenge!

Public defense Endre Putyora

Behavioural and electrophysiological measures of sleep in laying hens

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INVITATION 'MEET THE PHD JURY' EVENT

Lecture 'Sleep in cattle - an ongoing challange!'

Dr. Emma Ternman

December 5th 2023

Abstract

Dr Emma Ternman is an Associate Professor at Nord University, Norway. In her presentation, Dr Emma Ternman will take you on a journey through the history of sleep research in ruminants. She will discuss around the challenges in recording sleep in ruminants and present her own work on sleep in dairy cows as well as more recent work on alternative measures for sleep registrations.

Emma will give a talk for 45 minutes followed by a 30 min discussion session, and afterwards Emma will be happy to speak to people individually should you so wish to talk to her personally.

Where?

The lecture will take place on **December 5th 2023 at 15.30h**.

Auditorium D

Faculty of Veterinary Medicine
Ghent University, Campus Merelbeke
Salisburylaan 133, Merelbeke

How to attend?

The 'Meet the PhD jury' event is accessible to everyone without registration.

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INVITATION PUBLIC DEFENSE

Behavioural and electrophysiological measures of sleep in laying hens

Endre Putyora

December 5th 2023

PROMOTORS

Dr. Victoria Sandilands
Department of Agriculture, and Land-Based Engineering, Scotland's Rural College (SRUC)

Prof. dr. Frank Tuyttens
Faculty of Veterinary Medicine, UGent
Institute for Agricultural, Fisheries and Food Research (ILVO)

Curriculum Vitae

Endre Putyora received his Honours BSc in Zoology from the University of Guelph, Canada in 2014 where his bachelor's thesis observed the behavioural effects of exposure to alarm pheromone in goldfish (*Carassius auratus*). Subsequently, he went on to complete an MSc in Biology specialising in animal behaviour from the University of Zurich, Switzerland in 2017. His master's thesis focused on the effects of digestive physiology and anatomy on the selection of resting postures across 36 species of herbivorous mammals. After spending a brief amount of time in the pharmaceutical industry, he was selected as 1 of 14 PhD-students taking part in the ChickenStress Network, a Marie Skłodowska-Curie Action looking at the effects of stress and the stress response in commercial laying hens. His project focused on the effects of various environmental stressors on the sleep behaviour of laying hens. Throughout this work he authored several scientific publications and presented at a number of national and international conferences including most recently the XI European Symposium on Poultry Welfare and the WPSA UK Annual Spring Meeting where he was awarded the President's Prize for best student presentation. He has recently begun a postdoctoral position at the University of Stirling, Scotland.

Where?

The defense will take place on **December 5th 2023 at 17.00h**

Auditorium D

Faculty of Veterinary Medicine
Ghent University, Campus Merelbeke
Salisburylaan 133, Merelbeke

After the PhD defense, there will be a small reception held in the building.

How to attend?

The public defense is accessible to everyone without registration.

If you would like to attend the reception to be held afterwards, please register before **November 21st**, by email to endre.putyora@ugent.be.

Members of the Jury

Prof. dr. Gunter Antonissen
Chairman of the Jury
Faculty of Veterinary Medicine, UGent, BELGIUM

Prof. dr. An Garmyn
Secretary of the Jury
Faculty of Veterinary Medicine, UGent, BELGIUM

Dr. Kobe Buyse
Faculty of Veterinary Medicine, UGent, BELGIUM

Dr. Paul-Antoine Libourel
French National Centre for Scientific Research, Université Claude Bernard Lyon 1, FRANCE

Dr. Emma Ternman
Faculty of Biosciences and Aquaculture, Nord University, NORWAY

Summary

Stress has been shown to have a negative effect on sleep behaviour in a multitude of species. These effects can range from a later onset of sleep, to increased sleep fragmentation, to outright deprivation of sleep stages. Chronic restriction of sleep can have severe consequences including compromised immune system function, reduced cognitive capabilities and death. This issue is further compounded by the fact that a chronic lack of sleep is itself stressful and aids in perpetuating this cycle. Our understanding of the ultimate function of sleep is lacking and based primarily on studies done in mammalian species. By comparison, our understanding of sleep in avian species is relatively limited. Not only does the study of sleep in birds provide fundamental benefits towards our understanding of the purpose and functionality of sleep, but a better understanding of this behaviour can also be applied in order to improve the welfare of commercially kept animals including laying hens.

The first step in better understanding sleep behaviour in laying hens was to identify what constitutes baseline sleep and to determine its sensitivity under short-term, mild disturbances (**chapter 3**). Hens were implanted with electroencephalogram (EEG) devices to record brain activity, while also being recorded by infrared video cameras, and were studied over several days (lights on and off) for evidence of sleep (both from brain waves and observed behaviours). On some nights, hens were disturbed to disrupt sleep. Results showed that laying hens on undisturbed (baseline) nights spent 58% of the night engaged in slow-wave sleep (SWS), 25% awake and the remaining 17% in rapid eye movement (REM) sleep. Birds showed sleep behaviour quickly following lights off and became more active towards the end of the lights off period with bouts of arousal spread throughout the night. Hens subjected to 90 dB noise, wind from a fan and 20 lux light presented in a structured sequence consistently awoke from sleep. However, the cumulative total of sleep lost was made up for by increased SWS during the final 2 hours of darkness prior to lights on. This most likely explains the lack of recovery sleep during the following lights on period. These findings contribute to our understanding of sleep behaviour in laying hens as well as highlighting the level of resilience towards short-term sleep disturbance they have.

The second experiment focused on Increasing both the Intensity and duration of sleep disturbances as well as making them more commercially relevant (**chapter 4**). The same EEG-implanted hens (after a period of rest) were subjected to 24-h disturbances (i.e., feed deprivation, increased ambient temperature, or simulated footpad pain). Results from the undisturbed and recovery nights were in keeping with the findings for Experiment 1 with regards to baseline sleep behaviour. There was a large disparity in the effectiveness of the disturbances. Feed deprivation had no effect whatsoever, while footpad pain showed some degree of effect, more so during the lights on period, but there appeared to be little effect on sleep behaviour overall. Increased ambient temperature significantly reduced REM sleep during lights off to the point of near elimination and likely increased the degree of sleep fragmentation experienced by the birds. While recovery sleep was not evidenced in this study by way of daytime sleeping or greater amounts of sleep the following night, a consistent reduction in REM sleep (for example, with ongoing thermal discomfort over days or weeks) would likely have

detrimental effects on hen welfare. This may be increasingly probable in the future, given the ongoing global climate crisis, resulting in increased temperatures.

Recommendations stemming from this work are that more attention should be paid to the natural nocturnal behaviours of laying hens including ensuring that they are able to consistently engage in a sufficient amount of sleep commensurate with their biological requirements. Excessive daytime napping may be indicative of a lack of sufficient sleep at night, which could be further investigated using observable behaviours viewed using infrared cameras. Producers should aim to maintain suitable temperatures in hen sheds that are also able to combat increasing global temperatures. If the suggested recommendations cannot be successfully employed, it is likely that the welfare of laying hens will be compromised.