GHENT UNIVERSITY

FACULTY OF VETERINARY MEDICINE
accredited by EAEVE

Equine Cardioteam Ghent

INVITATION PUBLIC DEFENSE

Development of 12-lead electrocardiography and vectorcardiography for improved arrhythmia diagnosis in horses.

Ellen Paulussen, DVM, Dip ECEIM

29/01/2026, 17.00h

PROMOTORS

Prof. dr. Gunther van Loon
Faculty of Veterinary Medicine, UGent

Dr. Glenn Van Steenkiste
Faculty of Veterinary Medicine, UGent

Prof. Dr. Tammo Delhaas
Maastricht University Medical Centre

Curriculum Vitae

Ellen Paulussen was born on 17 March 1989 in Halle. She began her studies in Veterinary Medicine at Ghent University in 2007. In 2013, she obtained the degree of Master of Veterinary Medicine (Equine option) with distinction. Immediately after graduation, Ellen started a rotating equine internship with a focus on Surgery and Anesthesiology. Following this year, she joined the Department of Internal Medicine of Large Animals to undertake specialist training in Equine Internal Medicine (ECEIM Residency). In 2018, in addition to working half-time as a clinical assistant at the Department of Equine Internal Medicine in Merelbeke, Ellen was also employed half-time at Dierenkliniek De Lingehoeve in the Netherlands. In 2019, she obtained the title of Diplomate of the European College of Equine Internal Medicine (ECEIM).

From February 2019 onwards, Ellen has been appointed as an assistant at the (renamed) Department of Internal Medicine, Reproduction and Population Medicine. She has been extensively involved in clinical work, the education of final-year students, and the supervision of multiple specialists in training (residents). Since October 2022, Ellen has been one of three representatives of the Assistant Academic Staff (AAP) at both faculty and central university levels. In this role, she is also a member of the Faculty Council and the Department Council. In addition, she serves on the Clinical Biosecurity Subcommittee and the Faculty Committee for Internationalization. Ellen is also a scientific staff member at Velab, where she provides scientific advice to equine veterinarians. This role was combined with doctoral research focusing on the development of a novel 12-lead ECG configuration for horses.

Ellen Paulussen is first author of seven and co-author of ten peer-reviewed, scientific publications. She has also been an invited speaker at five national and international conferences. In 2016, she received the BEVA Award for Best Oral Presentation at the Spring Meeting in The Hague, the Netherlands.

Where?

The defense will take place on the 29th of January 2026 at 17.00h

Auditorium A

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

After the defense, a reception with walking dinner will take place in classroom 1.1 (former library), located upstairs in the Dean's Building (entrance 2).

How to attend?

If you would like to attend, please register before the 22nd of January, by email to ellen.paulussen@ugent.be or 0474 89 19 30.

Members of the Jury

Prof. dr. Ann Martens (Chair)
Faculty of veterinary science, UGent

Prof. dr. Gunther van Loon (Promotor)
Faculty of veterinary science, UGent

Dr. Glenn Van Steenkiste (Promotor)
Faculty of veterinary science, UGent

Prof. dr. Tammo Delhaas (Promotor)
Maastricht University Medical Centre

Prof. dr. Stijn Schauvliege
Faculty of veterinary science, UGent

Dr. Katharyn Mitchell
Cornell University, USA

Dr. Hans De Wilde
University Hospital Ghent

Prof. Dr. Kathleen Mc Entee
Faculty of Medicine, Université Libre de Bruxelles (ULB)

Summary

Arrhythmias are common in horses and can range from benign, vagally mediated rhythm disturbances to clinically significant conditions associated with poor performance, collapse, or sudden death. Accurate assessment of pathological arrhythmias requires evaluation of both their hemodynamic impact and their potential to progress to life-threatening rhythms. Atrial fibrillation is the most clinically relevant equine arrhythmia, while other atrial and ventricular ectopic rhythms may also pose substantial risk and increasingly represent targets for interventional treatment.

Progress in equine arrhythmia management has been limited by suboptimal electrocardiographic techniques. Historically, ECG electrode configurations adapted from human medicine underestimated equine cardiac electrical activity, restricting ECG use largely to rhythm and heart rate analysis and hindering scientific advancement. The absence of a standardized, horse-specific ECG configuration has been a major obstacle.

This doctoral research aimed to develop a standardized, equine-adapted ECG system that supports advanced electrocardiographic analysis. A novel Delta (Δ) configuration of Einthoven's triangle was designed and expanded into a full 12-lead ECG, enabling construction of an orthogonal lead system for vectorcardiography (VCG). This approach allows detailed characterization of atrial and ventricular activation, improved differentiation of arrhythmia origin, and correlation of electrical findings with cardiac anatomy.

The Delta 12-lead ECG and VCG were validated experimentally and clinically. Pacing studies demonstrated accurate non-invasive localization of ectopic activation, particularly at the chamber level, while clinical cases showed strong agreement between VCG-based predictions and electro-anatomical mapping. Common anatomical sources of atrial and ventricular ectopy were identified, providing insight into arrhythmia mechanisms.

Overall, the combination of Delta 12-lead ECG and VCG offers a practical, reliable, and non-invasive method for localizing arrhythmogenic foci in horses. Its routine application has the potential to improve diagnostic accuracy, risk stratification, and planning of interventional therapies, while contributing to a better understanding of equine arrhythmias and sudden cardiac death.