



Breath Characteristics and Adventitious Lung Sounds in Healthy and Asthmatic Horses

Eloïse Greim¹, Jan Naef¹, Sophie Mainguy-Seers², Jean-Pierre Lavoie², Sophie Sage¹, Gaudenz Dolf¹, Vinzenz Gerber¹

¹ Swiss Institute of Equine Medicine (ISME), Department of Clinical Veterinary Medicine, Vetsuisse-Faculty, University of Bern, Bern, Switzerland

² Faculty of Veterinary Medicine, Department of Clinical Sciences, University of Montréal, St-Hyacinthe, QC, Canada

Introduction

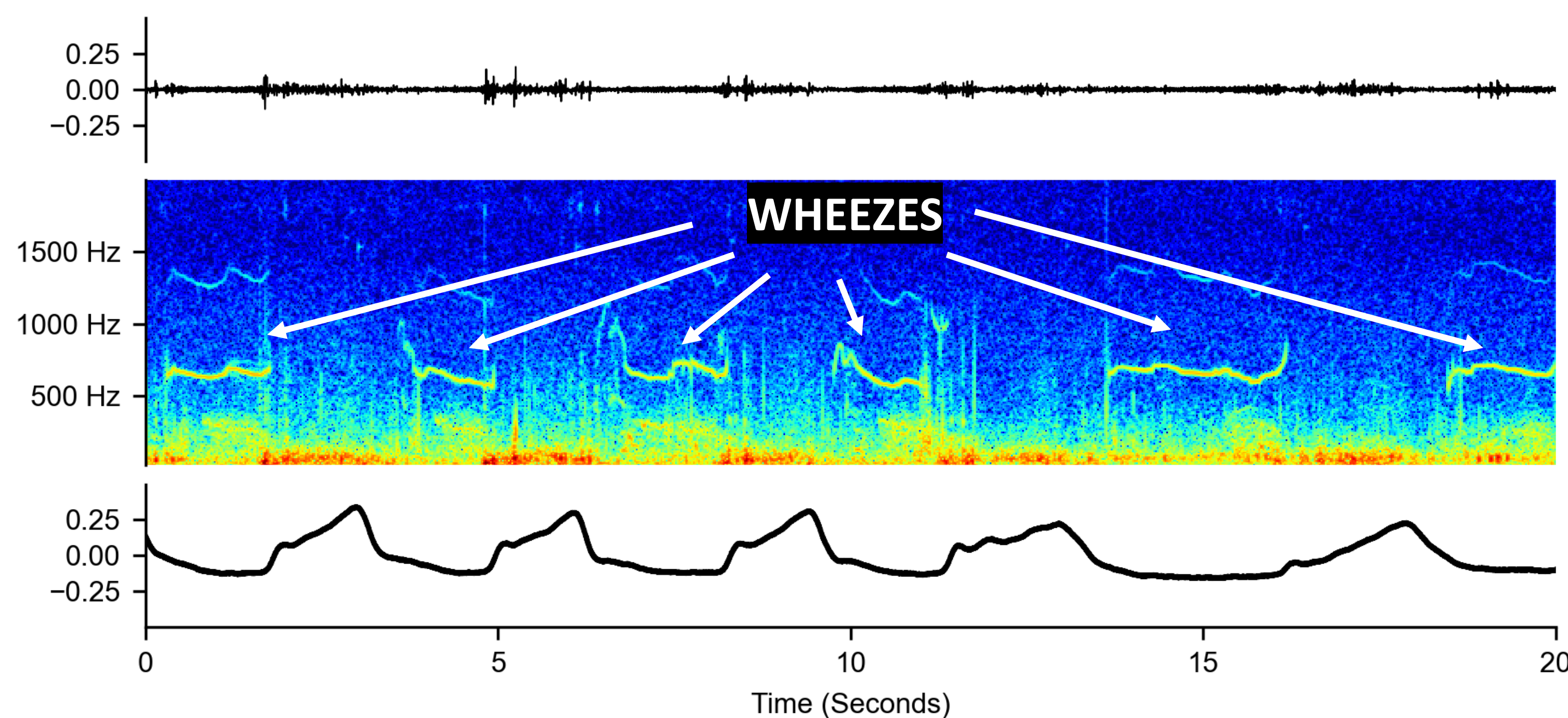
Thoracic auscultation is a mainstay in the diagnostic work-up of equine asthma (EA), but suffers from limitations, including low sensitivity for transient or localized lung sounds, high subjectivity, and lack of systematic analysis of breath sounds in asthmatic horses.

Objectives

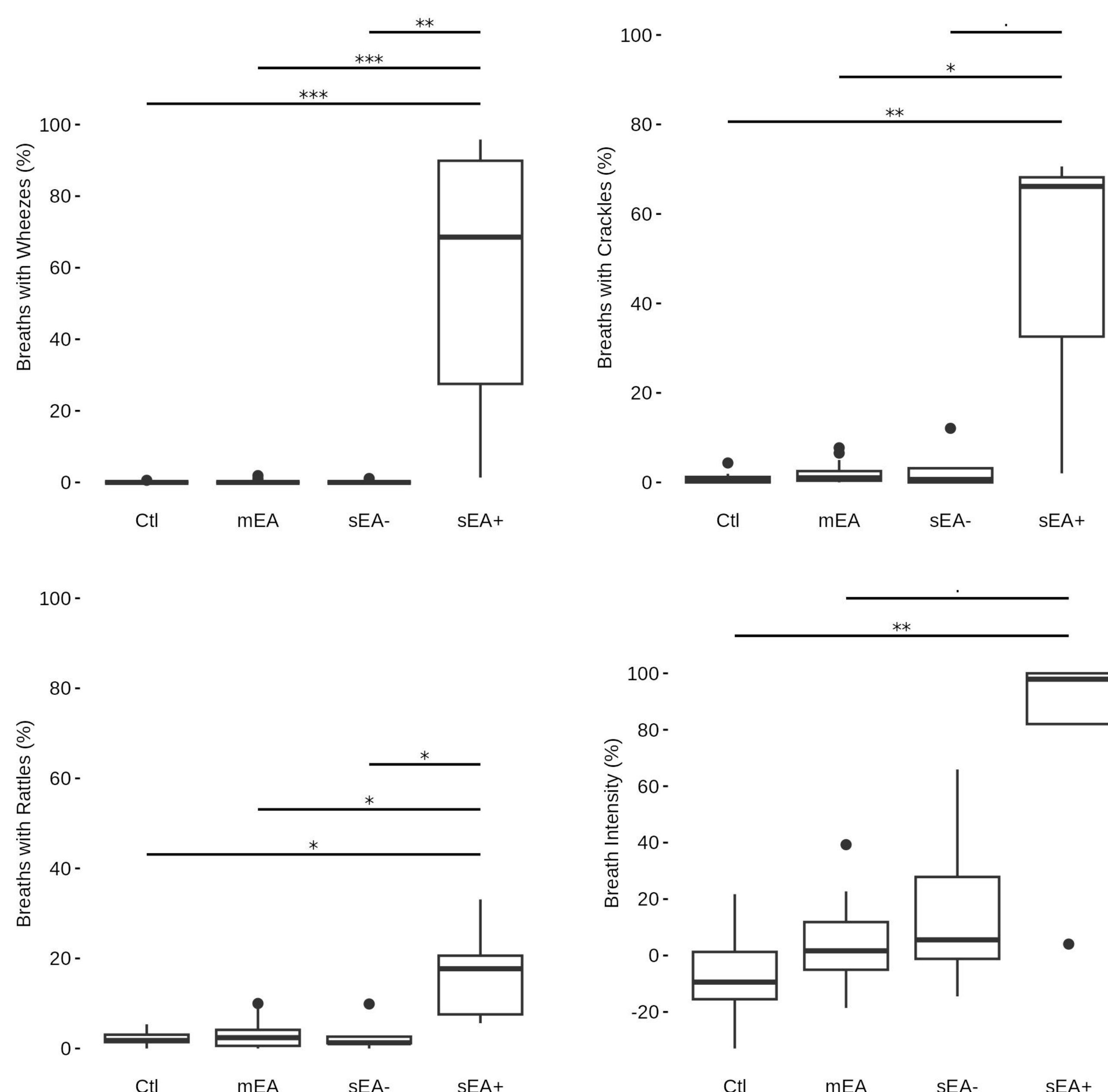
Use digital auscultation to compare breath parameters and occurrence of adventitious sounds in healthy and asthmatic horses.



Digital auscultation device



Visual representation of wheezes as waveform (top), spectrogram (middle) and plethysmography curve (bottom)



Proportions of adventitious breath sounds per study group. · = $P < .1$, * = $P < .05$, ** = $P < .01$, *** = $P < .001$

Materials & Methods

- Study population
 - 12 healthy control horses (ctl)
 - 12 horses with mild to moderate EA (mEA)
 - 10 horses with severe EA (sEA)
 - 5 in remission [sEA-]
 - 5 in exacerbation [sEA+]
- Horse population characteristics
 - Clinical evaluation
 - Tracheal mucus score
 - Bronchoalveolar lavage fluid (BALF) cytology
 - Lung function
- Digital auscultation
 - In 11 locations simultaneously for one hour
- Analysis
 - 100 breaths per recording randomly selected, blindly categorized, and statistically analyzed

Results

The novel digital auscultation method provided high-quality recordings and allowed characterization and quantification of breath duration and variability, breath intensity as well as adventitious sounds. Adventitious sounds were significantly more frequent in sEA+, but not in sEA- or mEA, compared to ctl. Breath intensity was also significantly higher in sEA+ than in sEA-, mEA, and ctl.

Conclusions & clinical importance

By overcoming some of the limitations of traditional auscultation methods, this digital approach can provide more accurate and objective assessments of respiratory conditions in horses, potentially supporting diagnosis, monitoring, and management of EA. However, larger studies are required to determine its ability to discriminate mildly to moderately asthmatic from healthy horses. Additionally, exploring its potential in other respiratory disorders warrants further research. The dataset is also used to train an automated machine-learning algorithm.

Acknowledgements

The authors would like to thank the Stiftung Pro Pferd and ISMEquine Research for their financial support. They would also like to thank the Swiss Association for Animal Sciences (SAAS) for financial support for participation in the ECEIM congress in Lyon.