

FACULTY OF VETERINARY MEDICINE

**Presenting Sponsor** 



## Calgary International Equine Symposium

**Associated Pathologies in the Equine Athlete** 

September 4 & 5, 2025





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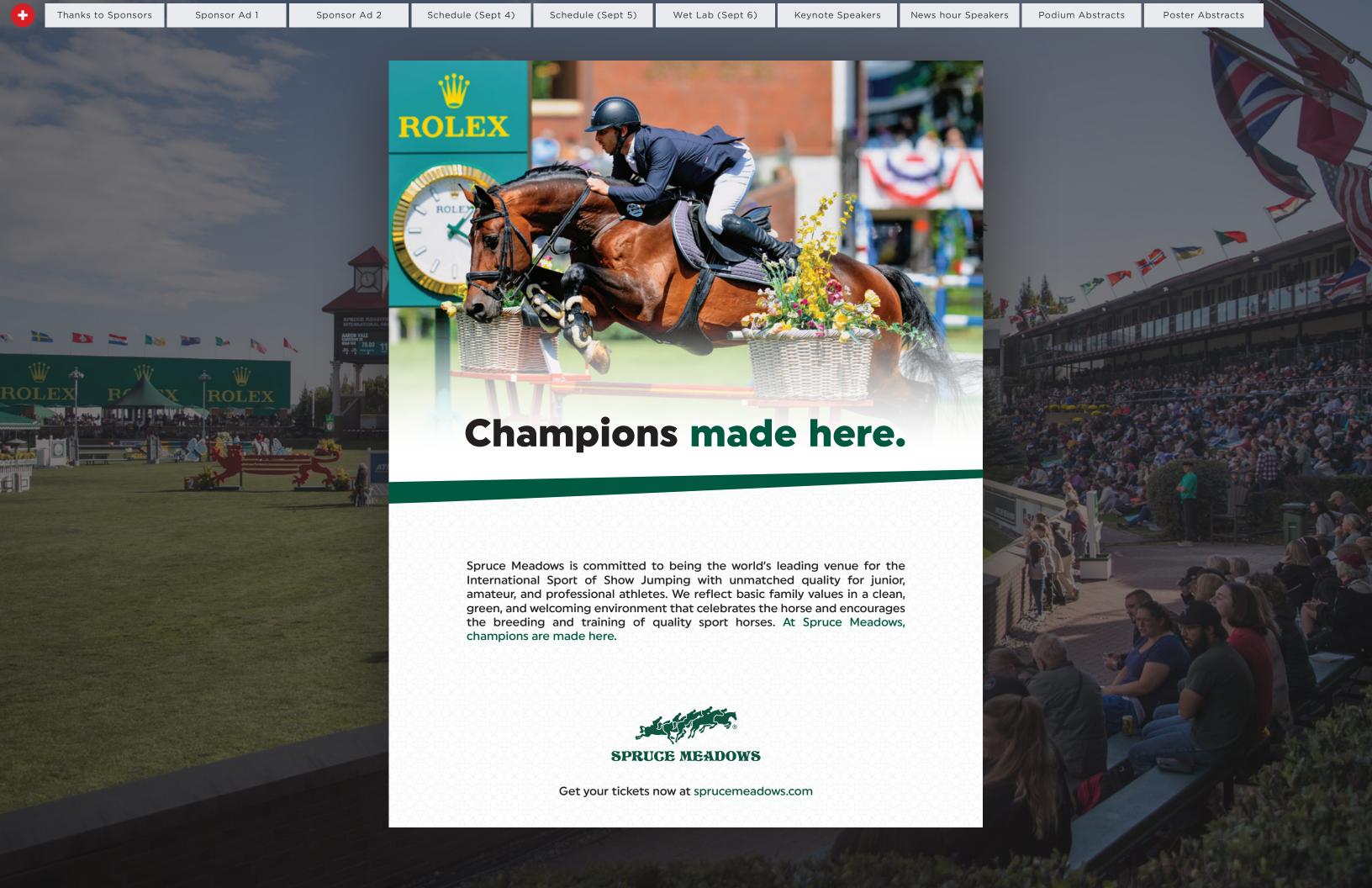


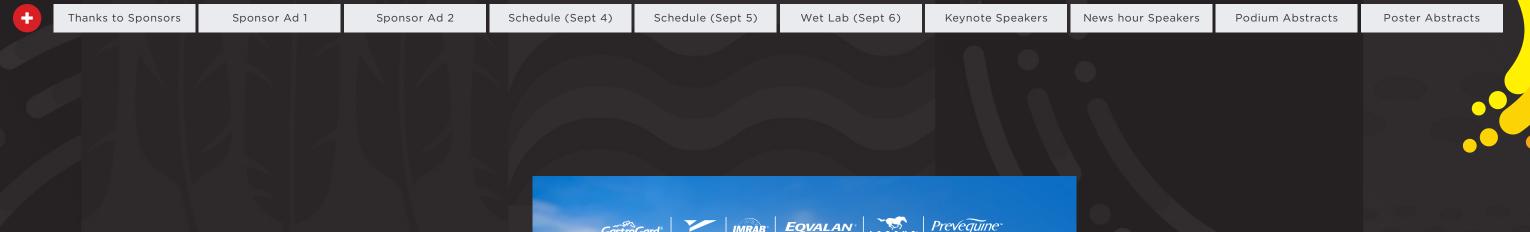










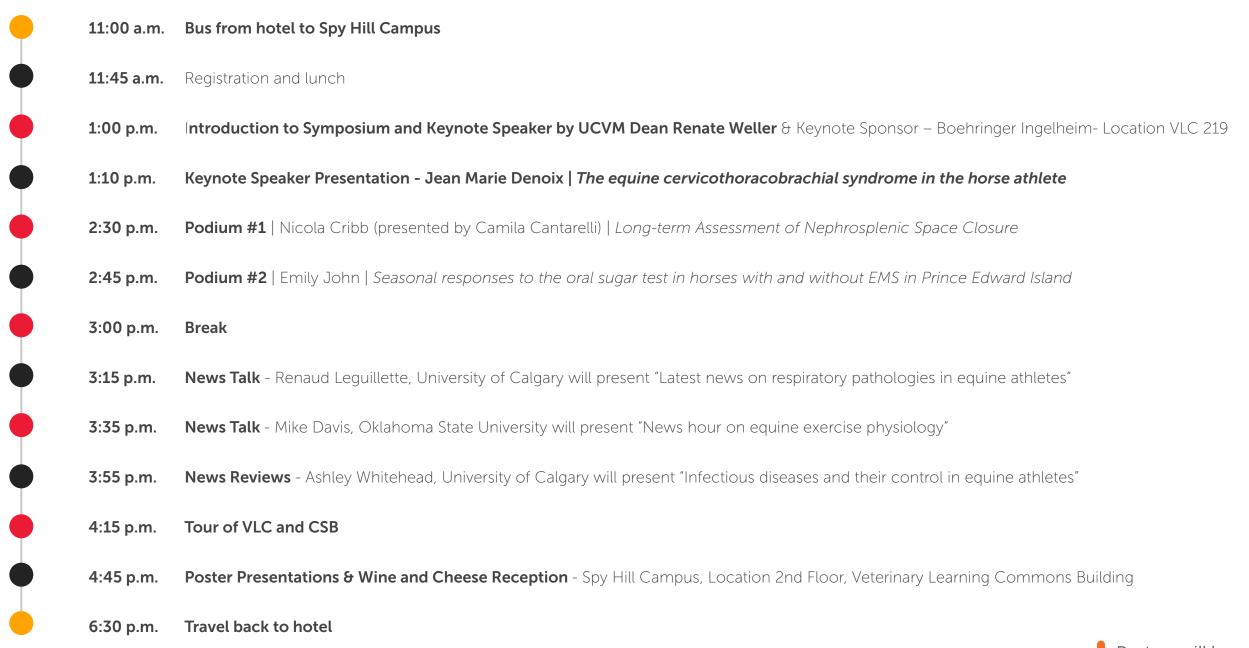






## Thursday, September 4

Veterinary Learning Commons Building (2nd Floor), Spy Hill Campus

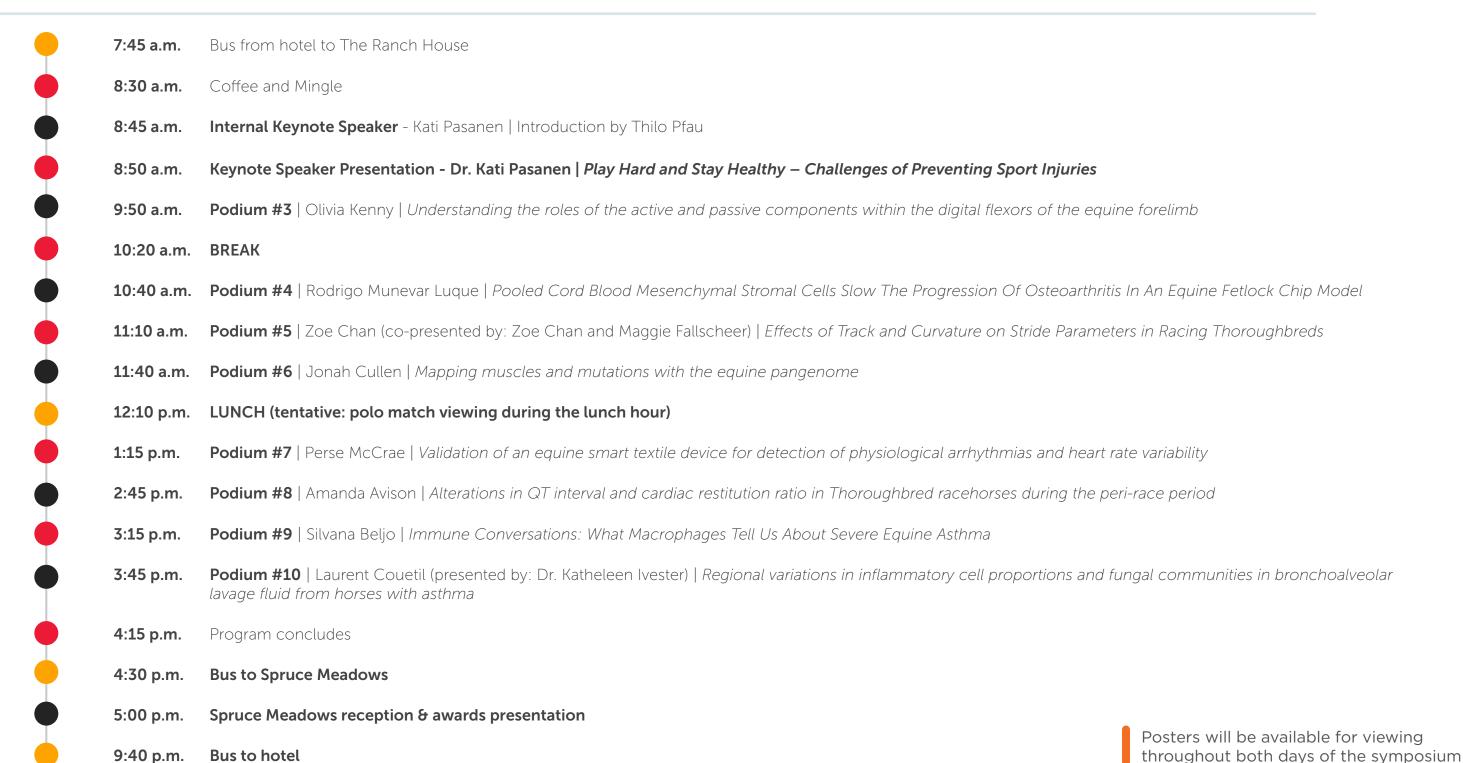




## **Program Schedule**

## Friday, September 5

The Ranch House, Calgary Polo Club (24041 306 Ave W, Okotoks, AB T1S 1A2)



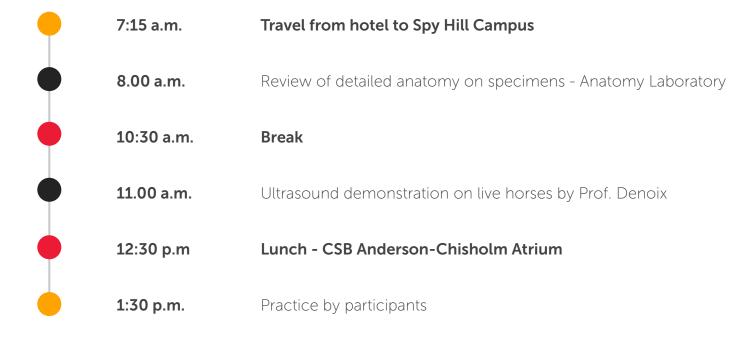




## Saturday, September 6 (Wet Lab)

Spy Hill Campus, Clinical Skills Building

Topics: Utrasonographic hotspots: Suspensory ligament, Stifle, Caudal neck









Jean-Marie Denoix

DVM, Ph.D., Assoc. LA-ECVDI, DECVSMR (Equine), DACVSMR (Equine) | Professor of Veterinary Anatomy and Equine Locomotor System Pathology and Rehabilitation, National Veterinary School, France

Dr. Jean-Marie Denoix, an internationally renowned horse physiotherapist and leader in equine anatomy and imaging, has mentored thousands worldwide. Born in France in 1954, he studied veterinary medicine in Lyons, graduating in 1977, and went on to specialize in anatomy, imaging, and biomechanics, lecturing in over 30 countries.

A Professor at the National Veterinary School in France, ACVSMR Diplomate, and Founding Diplomate of the European College of Veterinary Sport Medicine and Rehabilitation, Dr. Denoix pioneered innovative imaging techniques—particularly ultrasound—sharing his expertise through books, lectures, and more than 40 publications.

He has served as imaging specialist at two World Equestrian Games, collaborated with farrier organizations, and authored influential anatomy texts used by veterinarians and students worldwide. Through the International Society for Equine Locomotor Pathology, he has trained over 10,000 veterinarians, advancing global clinical practice.

A driving force in equine musculoskeletal diagnostics, Dr. Denoix's work has transformed understanding and practice in equine medicine.



Dr. Kati Pasanen

PT, MSc, PhD | Associate Professor, Faculty of Kinesiology, University of Calgary

Dr. Kati Pasanen is an Associate Professor and sport scientist at the University of Calgary, where she leads a research program in sport injury prevention and teaches courses in sport medicine. She is Director of the Clinical Biomechanics Lab and Co-Lead of the Integrative Neuromuscular Sport Performance Laboratory.

A former national-level showjumper and hockey player, and later an international coach, physiotherapist, and researcher, she brings over 35 years of experience working with elite athletes.

Her research focuses on preventing traumatic knee injuries in sports, especially among female athletes, using clinical, biomechanical, and epidemiological study designs. Her lab develops and evaluates training strategies to enhance performance and reduce injury risk by improving technique, optimizing movement control, and strengthening functional joint stability in high-risk movements like running, cutting, and landing.

Outside of academia, she enjoys hiking, biking, paddleboarding, and skiing, and dreams of one day returning to the countryside to own horses again.





## **News hour Speakers**





## Michael Davis

Professor, Oklahoma State University

Dr. Michael S. Davis is a veterinary physiologist and board-certified specialist in veterinary internal medicine and veterinary sports medicine at Oklahoma State University where he conducts research on animal exercise physiology and performance. His studies in horses have demonstrated the induction of asthma-like airway disease by strenuous exercise performed in cold environments. Canine studies have included the development and validation of preventative methods for exercise-induced gastric disease as well as helping to identify novel metabolic pathways used by elite canine athletes to support fatigue-resistant endurance exercise. These studies have provided the United States Armed Forces with valuable information on the physiological capabilities of working dogs, as well as the methods for producing maximal performance and sustainability of these dogs. His current research focus is the mechanisms by which mitochondria maintain (or fail to maintain) adequate supply of ATP during physiochemical extremes typical of strenuous exercise such as high temperature and low pH. As a professional educator for 20 years and with numerous national and international speaking events, Dr. Davis has extensive training and experience in educating a variety of different audiences.



## Ashley Whitehead DVM, BSc, DVSc, DACVIM-LA

Associate Professor (Teaching), Faculty of Veterinary Medicine, University of Calgary

Dr. Ashley Whitehead is an Associate Professor and Associate Dean of Clinical Programs at the University of Calgary's Faculty of Veterinary Medicine. A board-certified specialist in Large Animal Internal Medicine, she teaches across the curriculum and provides clinical care at Moore Equine Veterinary Centre. Her research focuses on equine infectious diseases, gastrointestinal conditions, and neonatal foal health, and she has published on vaccine development, placental characteristics, and reproductive outcomes in mares. She also contributes to the profession through committee service, including her role as incoming chair of the American Association of Equine Practitioners' Healthy Practice Committee.



## Dr. Renaud Léguillette, DVM, MSc, PhD, DACVIM, DACVSMR

Professor of Equine Internal Medicine, Faculty of Veterinary Medicine, University of Calgary

Dr. Renaud Léguillette is a Professor of Equine Internal Medicine at the University of Calgary's Faculty of Veterinary Medicine, where he holds the Calgary Chair in Equine Sports Medicine. He leads the Equine Respiratory Lab, focusing on equine asthma, exercise-induced pulmonary hemorrhage, and cardiovascular performance in sport horses. His research integrates field-based studies and biomedical engineering to enhance horse health and safety, particularly in high-performance settings like the Calgary Stampede. Dr. Léguillette is also affiliated with the Libin Cardiovascular Institute and maintains an active clinical practice at Moore Equine in Balzac, Alberta.







## Nicola Cribb

Ontario Veterinary College, University of Guelph

### Long-term Assessment of Nephrosplenic Space Closure

#### **AUTHOR NAME / AFFILIATION**

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- Brigitte Brisson, DMV, DVSc, DACVS Department of Clinical Studies, Ontario Veterinary College, University of Guelph, Guelph, Ontario, Canada
- Alex zur Linden, DVM, DACVR Department of Clinical Studies, Ontario Veterinary College, University of Guelph, Guelph, Ontario, Canada
- Jeff Caswell, L., DVM, DVSc, PhD, DACVP Department of Pathobiology, Ontario Veterinary College, University of Guelph, Guelph, Ontario, Canada

#### **ABSTRACT**

#### Introduction

Long-term assessment of nephrosplenic space (NSS) closure following laparoscopic ablation is lacking, and the predictive value of ultrasonography and rectal palpation is unknown. The objectice was to assess NSS closure 5 years post-operatively using a novel adhesion scoring system and to evaluate the reliability of rectal and ultrasonographic findings in predicting adhesion adequacy.

#### Methods

Twelve research horses underwent laparoscopic NSS ablation. Rectal palpation and ultrasonography were performed pre-operatively, and at 30 days and 5 years post-operatively. Ultrasonographic measurements of the cranial and caudal distances between the renal fascia and spleen were recorded. At 5 years, the adhesions were scored laparoscopically and compared with imaging and palpation findings. Additionally, intraoperative surgical ablation factors were tested as predictors for satisfactory adhesions. Logistic regression was used for statistical analysis (p<0.05).

#### Results

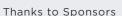
Three of 11 horses had inadequate adhesions (<25% of NSS), while the remaining had strong adhesions in >50% of the space. Rectal palpation significantly predicted adhesion presence (p=0.047). Caudal ultrasonographic measurements decreased over time (p<0.05) but were not predictive of adhesion adequacy. Cranial measurements could not be included in the study because bowel interference precluded data acquisition. Intraoperative factors did not predict a satisfactory adhesion.

#### Conclusion

Laparoscopic NSS ablation resulted in long-term adhesion formation in most horses. Rectal palpation proved reliable, while ultrasonography had limited utility. Post-mortem findings confirmed laparoscopic adhesion scores in four cases. This study supports the long-term effectiveness of the laparoscopic closure of the NSS and may help increase client confidence and adherence to this preventative surgical intervention.









## **Emily John**

Atlantic Veterinary College, University of Prince Edward Island

## Seasonal responses to the oral sugar test in horses with and without EMS in Prince Edward Island

#### **AUTHOR NAME / AFFILIATION**

- Emily John, DVM, PhD, DACVIM-LAIM | Department of Health Management, Atlantic Veterinary College, University of Prince Edward Island
- Kathleen MacMillan, DVM, MSc, DAVBP (Equine) | Department of Health Management, Atlantic Veterinary College, University of Prince Edward Island
- Noel Clancey, DVM, MVSc, DACVP | Department of Pathology and Microbiology, Atlantic Veterinary College, University of Prince Edward Island
- Jennifer Burns, DVM, MSc, DAVBP (Equine) | Department of Health Management, Atlantic Veterinary College, University of Prince Edward Island

#### **ABSTRACT**

#### Introduction

Long-term assessment of nephrosplenic space (NSS) closure following laparoscopic ablation is lacking, and the predictive value of ultrasonography and rectal palpation is unknown. The objectice was to assess NSS closure 5 years post-operatively using a novel adhesion scoring system and to evaluate the reliability of rectal and ultrasonographic findings in predicting adhesion adequacy.

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## **Olivia Kenny**

Biomedical Engineering Department, McCaig Bone and Joint Institute, University of Calgary

Understanding the roles of the active and passive components within the digital flexors of the equine forelimb

#### **AUTHOR NAME / AFFILIATION**

- Olivia Kenny University of Calgary Biomedical Engineering Department, McCaig Bone and Joint Institute
- Nigel Shrive University of Calgary Civil Engineering Department, McCaig Bone and Joint Institute
- Kasara Toth University of Calgary Veterinary Medicine, McCaig Bone and Joint Institute
- John E.A. Bertram University of Calgary Cumming School of Medicine, McCaig Bone and Joint Institute
- Holly Sparks University of Calgary Veterinary Medicine, McCaig Bone and Joint Institute

#### **ABSTRACT**

Of the digital flexor tendons within the equine forelimb, the superficial digital flexor tendon (SDFT) is preferentially injured, affecting up to 13% of racehorses. The equine forelimb is supported by a combination of active (muscle) and passive (tendon and ligament) components. The distal limb has both types of supports integrated as the digital flexors muscletendon units and their accessory ligaments. The roles and relationships of the active and passive components are not clear, especially when evaluating injury risks. Utilizing a novel testing frame and cadaveric samples, compressive limb loading and muscle engagement forces were applied while displacements, tendon strains, and joint angles were measured. For all samples tested, when both digital flexor muscles were engaged, the fetlock drop was the smallest and the SDFT strained the least. With neither muscle engaged, the fetlock drop was the largest and the SDFT strained the most. Non-significant differences in fetlock drop or SDFT strain occurred when either digital flexor muscle was engaged individually. When evaluating the passive supports, the transection of the accessory ligament of the SDFT, compared to the intact limb, resulted in a ~6-degree fetlock drop angle and a ~2.5% increase in SDFT strain. Transection of the accessory ligament of the deep digital flexor tendon (DDFT) resulted in a ~1-degree change in fetlock drop and a ~0.25% SDFT strain. Overall, this work begins to determine the different roles of active and passive components of the digital flexors in the equine forelimb.







## Rodrigo Munevar Luque

Ontario Veterinary College, University of Guelph

## Pooled Cord Blood Mesenchymal Stromal Cells Slow The Progression Of Osteoarthritis In An Equine Fetlock Chip Model

#### **AUTHOR NAME / AFFILIATION**

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#### **ABSTRACT**

Osteoarthritis (OA) causes over 60% of equine lameness and affects more than 50% of horses over 15 years of age. This study evaluated the safety and efficacy of pooled cryopreserved equine umbilical cord blood-derived mesenchymal stromal cells (eCB-MSCs) in an equine model of OA induced by a surgically created osteochondral fragment in the proximal phalanx. Twelve Standardbred horses underwent arthroscopic fragment creation in one front fetlock and were exercised regularly. At six weeks after injury creation, horses received an intra-articular injection of either 10 million eCB-MSCs in hyaluronic acid (n = 6) or saline (n = 6) as control. Outcomes were assessed through lameness evaluation, radiography, synovial fluid analysis, and Whole-Organ Magnetic Resonance Imaging Score (WORMS) at 5 and 10 weeks post-injury. The data were analyzed using a linear mixed model in SAS. No adverse reactions were observed following eCB-MSC administration. eCB-MSC treated horses showed improved WORMS (median change -1.16, IQR -3-0) compared to deterioration in controls (+2.5, IQR +2-+4; p = 0.03). Lameness Locator® analysis revealed decreased lameness in the eCB-MSC group 7 weeks post-treatment (adjusted difference:  $-32.3 \pm 9.5$  mm; 95% CI: -54.1 to -10.4; p = 0.009). Cytokine synovial fluid analysis showed significant mean fluorescent intensity (MFI units) differences in treated horses, including reduced TNF- $\alpha$  (-18 MFIu, p = 0.017), reduced IL-1 $\beta$  (-66.6 MFIu, p = 0.002), and elevated IL-18 (+46.9 MFIu, p = 0.0142). These findings support the safety and potential diseasemodifying efficacy of eCB-MSCs for managing OA in horses.









## **Zoe Chan**

Faculty of Kinesiology, University of Calgary

## Effects of Track and Curvature on Stride Parameters in Racing Thoroughbreds

#### **AUTHOR NAME / AFFILIATION**

- Maggie Fallscheer | Faculty of Science, University of Calgary
- Zoe Chan | Faculty of Kinesiology, University of Calgary
- Brittany Davis | Faculty of Kinesiology, University of Calgary
- Matthijs van den Broek | University of Calgary and Delft University of Technology
- Thilo Pfau | Faculties of Veterinary Medicine and Kinesiology, University of Calgary

#### **ABSTRACT**

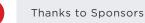
**Introduction**: Understanding how stride characteristics adapt to external factors during racing is critical for improving injury prediction. We analyzed in-race data collected at two racetracks with different track geometry (Century Mile, Century Downs). Specifically, we investigated how stride parameters change as a function of speed at various locations on the track, and whether these relationships differ between the two racetracks.

Methods: GNSS recordings from 178 races (Mile: 140, Downs: 38) involving 38 Thoroughbred racehorses were segmented into 100-m sections. Average speed, stride length, and stride frequency were computed per section. Track curvature was classified into straight (<5°) or curve (>30°) from cumulative heading change. Linear mixed-effects models (random factor: horse) assessed the effects of curvature and track on speed, and tested interactions between speed and stride parameters.

**Results**: In straight sections, speed was 0.22m/s higher at Mile than Downs (p<0.001). Stride length and frequency showed no interaction with track, and both increased with speed (p<0.001); stride length was 0.252m longer and frequency increased by 0.06Hz per 1m/s increase. In curve sections, curvature had no significant effect at Mile (p=0.08) but reduced speed by 0.014m/s per degree at Downs (p<0.001). Stride length increased by 0.257m per 1m/s (p<0.001) and was 0.304m longer at Mile (p=0.03). Stride frequency also increased with speed (p<0.001) but without significant track differences (p=0.07).

**Conclusion**: Stride parameters vary with speed, curvature, and track location. Given the reported link of reductions of stride parameters over time with musculoskeletal injury risk, understanding these relationships in-race allow better prediction models.









## **Jonah Cullen**

Department of Veterinary Population Medicine, University of Minnesota

### Mapping muscles and mutations with the equine pangenome

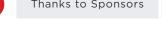
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- Ted Kalbfleisch | Department of Veterinary Science, Martin Gatton-College of Agriculture, Food and Environment, University of Kentucky, Lexington, KY, USA
- Brian W. Davis | College of Veterinary Medicine and Biomedical Sciences, Texas A&M University, College Station, Texas, USA
- Molly E. McCue | Department of Veterinary Population Medicine, University of Minnesota, Minneapolis, MN, USA

#### **ABSTRACT**

Centuries of selective breeding have shaped modern horses into specialized athletes with diverse musculoskeletal adaptations. While small genetic variants are well studied, larger structural variants (SVs) and breed-specific sequences remain largely underexplored due to limitations with linear reference genomes. In comparison, pangenomes integrate the genomes of multiple individuals to capture both shared and unique sequences, better reflecting species diversity. As part of the Equine Pangenome International Consortium (EPIC), we constructed a pangenome graph using 77 genome assemblies from 24 breeds spanning traditional stock breeds, gaited breeds, draft horses, ponies, performance and sport horse breeds, as well as the Przewalski's horse, capturing a spectrum of athletic phenotypes. We identified 226 Mbp of sequence (an 8.1% increase) absent in the complete, end-to-end linear Thoroughbred genome, revealing widespread structural variation across the genome. SVs overlapped 881 gene coding regions, including genes associated with musculoskeletal function and performance. For example, many SVs overlapped obscurin and nebulin, sarcomeric proteins critical for skeletal muscle structure and function. Variation in these and related genes may influence locomotion, endurance, and athletic ability in a breed-specific manner. This pangenomic approach highlights how SVs, variation previously undetectable using a single linear reference genome, may contribute to variation in athletic traits and associated pathologies. A more complete representation of equine genetic diversity with the pangenome provides a powerful new tool for understanding the genetic basis of performance-related injuries and developing breed-specific prevention strategies.







## Perse McCrae

University of Guelph

## Validation of an equine smart textile device for detection of physiological arrhythmias and heart rate variability

#### **AUTHOR NAME / AFFILIATION**

- Persephone McCrae | Department of Research and Development, Myant Inc, Toronto, ON | Department of Animal Biosciences, University of Guelph, Guelph, ON N1G 2W1, Canada
- Hannah Spong | Department of Animal Biosciences, University of Guelph, Guelph, ON N1G 2W1, Canada
- Jordyn Moorehead | Department of Animal Biosciences, University of Guelph, Guelph, ON N1G 2W1, Canada
- Wendy Pearson | Department of Animal Biosciences, University of Guelph, Guelph, ON N1G 2W1, Canada

#### **ABSTRACT**

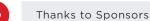
**Introduction**: Smart textile technology offers a novel approach for non-invasive, long-term cardiac monitoring in horses. While textile ECG devices have been developed, their validity for prolonged heart rate variability (HRV) assessment and detection of physiological arrhythmias remains unknown. Therefore, the objective of this study was to validate a smart textile ECG device over 6 h in healthy horses.

**Methods**: Simultaneous 6 h ECG recordings were obtained from 12 resting Warmblood horses using a smart textile device (Myant Skiin Equine) and a reference system (Televet 100). ECGs were evaluated by a blinded observer for physiological arrhythmias, and metrics of HRV were calculated. Agreement between devices was assessed using Bland-Altman analysis and a Lin's coefficient of concordance.

**Results**: Twenty-four ECG recordings (one per device per horse) were analyzed. Physiological arrhythmias were present in all recordings. Small biases and substantial to perfect agreement were found between the two devices for sinoatrial block ( $\rho c = 0.99$ ), sinus pause ( $\rho c = 0.96$ ), sinus arrhythmia ( $\rho c = 0.96$ ), sinus tachycardia ( $\rho c = 0.99$ ), and 2nd degree atrioventricular block ( $\rho c = 1.0$ ). Similarly, substantial to perfect agreement was found for all metrics of HRV.

**Conclusion**: The smart textile ECG device is a reliable and practical tool for prolonged monitoring of physiological arrhythmias and HRV in resting horses, supporting its use in equine health and performance management.









## **Amanda Avison**

Ontario Veterinary College, University of Guelph

## Alterations in QT interval and cardiac restitution ratio in Thoroughbred racehorses during the peri-race period

#### **AUTHOR NAME / AFFILIATION**

- Amanda Avison, Department of Biomedical Sciences, Ontario Veterinary College, University of Guelph, Guelph, Ontario
- W. Glen Pyle, IMPART Team Canada, Dalhousie Medicine, Dalhousie University, Saint John, NB & Women's Health Research Institute, BC Women's Hospital + Health Centre, Vancouver, BC
- Peter W. Physick-Sheard, Department of Population Medicine, Ontario Veterinary College, University of Guelph, Guelph, Ontario.

#### **ABSTRACT**

**Introduction**: Sudden cardiac death is a significant contributor to racehorse fatality. Cardiac restitution ratio (CRR), calculated as QT/TQ, has been used in humans at rest as a measure of arrhythmia risk. Factors associated with QT interval and CRR in Standardbred racehorses have been examined. However, the study contained insufficient cardiac cycles during the race to elucidate what occurs at maximal effort. The objective of this study was to characterize changes in the QT interval and CRR in Thoroughbred racehorses during maximal effort.

Methods: An automated restitution analysis was performed using 2709 pairs of cardiac cycles from 30 clinically healthy Thoroughbred horses. Cardiac cycles were obtained from exercise periods: pre-race; acceleration out of the gate; race; post-race exercise; and recovery. Multivariable linear regression analyses were performed with both QT interval and CRR as outcomes of interest.

**Results**: The QT-RR relationship varied by exercise period with cycles during maximal effort being distinct from those of the pre-race and recovery periods. Exercise period, RR interval and their interaction were the only significant associations during maximal effort. At the same RR intervals, QT intervals were longer and CRR higher pre-race than recovery. Additionally, there were many significant associations during the pre-race and recovery periods including interactions involving exercise period, RR interval, age, and sex.

**Conclusion**: The QT-RR relationship is multifactorial and factors associated with QT interval during maximal effort differ from other exercise periods. These finding suggests that changes in autonomic activity between exercise periods has biologically significant effects on myocardial electrophysiology.







## Silvana Beljo

Ontario Veterinary College, University of Guelph

Immune Conversations: What Macrophages Tell Us About Severe Equine Asthma

#### **AUTHOR NAME / AFFILIATION**

- Silvana Belio
- Emma Stacey
- Heng Kang
- Jutta Hammermueller
- William Ibbott
- Janet Beeler-Marfisi

#### **ABSTRACT**

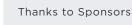
**Introduction**: Of the 700,000 mature horses in Canada, at least 100,000 have severe equine asthma (sEA)—a chronic and debilitating respiratory disorder that occurs when susceptible individuals are exposed to barn dusts. In the lung, alveolar macrophages (AMs) and recruited monocyte-derived macrophages (MDMs) recognize and respond to particulates. Our previous work showed that AMs in sEA horses respond differently to inflammatory stimuli than AMs. However, we do not know whether MDMs also function aberrantly in asthmatic horses.

Methods: To investigate this question, we challenged seven healthy and eight asthmatic horses with moldy hay for 48 hours. Then at 0 and 48 hours, we exposed their MDMs to a mixture of Aspergillus fumigatus spores, lipopolysaccharide, and silica microspheres, to mimic components of barn particulates, and cell culture medium as control. Twenty-three cytokines were measured using an equine multiplex immunoassay, and MDM mRNA expression was analyzed by RNA-seg.

**Results**: Both groups showed similar proinflammatory cytokine responses. However, sEA horse MDMs produced greater IL-10, suggesting that asthmatic horse MDMs have the potential to permit rather than guell the inflammatory response. Additionally, 48 hour control-condition MDMs from our most severely asthmatic horses showed increased expression interferon pathway genes, inflammatory regulators, and cytokines, which were downregulated in our healthy horses' MDMs-indicating that MDMs from severe asthmatics were transcriptionally primed for unbalanced/excessive activation. Finally, other correlations between gene expression versus cytokine production also reflected an aberrant MDM response in sEA horses.

**Conclusion**: These comprehensive findings indicate that inborn MDM dysregulation contributes to the sEA phenotype.







## **Laurent Couetil**

Purdue University, Veterinary Clinical Sciences

Regional variations in inflammatory cell proportions and fungal communities in bronchoalveolar lavage fluid from horses with asthma

#### **AUTHOR NAME / AFFILIATION**

- Laurent Couetil / Purdue University, Veterinary Clinical Sciences
- Kathleen Ivester / Purdue University, Veterinary Clinical Sciences
- Rebecca P. Wilkes / Purdue University, Comparative Pathobiology
- Devender Arora / / Purdue University, Bioinformatics Core
- Jyothi Thimmapuram / Purdue University, Bioinformatics Core

#### **ABSTRACT**

**Introduction**: Mild to moderate asthma in horses (MEA) is characterized by different endotypes based on bronchoalveolar lavage fluid (BALF) cytology. Fungal exposure is strongly implicated; however, the importance of specific fungi remains unknown. The objectives of this study were to evaluate the effects of US regions with distinct ecosystems (ecoregions) upon inflammatory cell proportions and fungal communities in the BALF of horses with MEA.

Methods: The effect of ecoregion upon BALF cytology from 916 horses with MEA was modeled using generalized linear models controlling for season and reported as mean (95%) confidence interval). Sixty banked BALF samples from 5 ecoregions were subjected to next-generation sequencing of fungal ribosomal RNA's internal transcribed spacer regions. Taxonomy was assigned using the UNITE database, and differential abundance between ecoregions was analyzed using pair-wise comparisons.

**Results**: Ecoregion had a significant effect on BALF neutrophils (p<0.0001) and eosinophils (p<0.0001) but not mast cells (p=0.18). BALF from the Northern Forests region had a lower abundance of Alternaria spp. and a higher abundance of Aspergillus spp. while having the highest neutrophil proportions (20.3%; 18.6-21.8%) and lowest eosinophil proportions (1.7%; 1.2-2.2%). Mediterranean California had fewer Cladosporium spp. and more Alternaria spp. while having the lowest neutrophil proportions (11.1%; 10.5-11.8%). BALF from the North American Deserts had the highest eosinophil proportions (4.2%; 3.5-5.0%) and an overabundance of Alternaria spp.

**Conclusion**: Asthmatic endotypes and the relative abundance of fungal genera recovered in BALF differ between ecoregions and are related, in part, to variations in environmental fungal exposure.









## Luis Arroyo

Ontario Veterinary College



#### **AUTHOR NAME / AFFILIATION**

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- <sup>1</sup>Departments of Clinical Studies and Ontario
- <sup>2</sup> Ministry of Agriculture, Food and Rural Affairs, 5th Floor NW, 1 Stone Road West, Guelph, Ontario N1G 4Y2

#### **ABSTRACT**

Diagnostic tests must be reliable for decision making process to direct adequate therapy and biosecurity recommendations. PCR is a sensitive and rapid diagnostic method for the clinical diagnosis of infectious agents. This study compared the performance and the level of agreement of two PCR tests, compared to bacteriological culture.

Clinical samples from 49 cases were submitted to the animal health laboratory of the University of Guelph. The Chi square test was used to assess binary variables such as culture positive or negative and, PCR positive or Negative, Kappa agreement test, and a Bland Altman plot was performed to assess the level of agreement between the 2 tests. Sensitivity and Specificity for each test were measured.

Five samples were positive for Strep equi equi on culture, all positive in the PCR1 and four positives in PCR2, Strep equi zooepidemicus growth in 15 samples, 4 positives in PCR1 and 6 in PCR2. 21/49 samples were false positives in PCR1 while 22/49 in PCR2.

Kappa test value 0.68, Sensitivity values were 100% and 83.3% for the PCR 1 and PCR 2, respectively, and specificity of 54.8% for PCR 1 and 52.4% for PCR2, bland Altman plot revealed an upper LoA 25.64 a lower LoA of -26.91 and a Bias of -0.63.

The Kappa test revealed a substantial agreement, The PCR test 1 reported ct values 0.64 cycles lower than test 2. The low specificity for the tests should be evaluated with a larger sample size. PCR tests were useful and agreed for the clinical diagnosis of S equi, although some samples yielded inconclusive results.









## **Marc Beaussart**

Animal Biomechanics and Sports Medicine School, Anglia Ruskin University (UK)

When Back Pain Limits Performance: Objective Links Between Mechanical Nociceptive Thresholds and Kinematics in Thoroughbreds

#### **AUTHOR NAME / AFFILIATION**

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#### **ABSTRACT**

**Objective**: To compare back kinematics range of motion (ROM) at trot with mechanical nociceptive thresholds (MNT) on 12 thoroughbreds with back pain.

Methods: Twelve adult Thoroughbreds with clinical back pain and in training were observed. An objective assessment of MNT on 17 anatomical landmarks was performed by pressure algometry. The results obtained were compared with quantitative kinematic data. The horses were put to trot with dorsal kinetic sensors (EquiGait) measuring ROMs between withers (W) and sacrum (S) on 9 anatomical landmarks.

**Results**: The most significant correlations score between MNT and ROM (r>.6; p<.5 - Spearman's rank correlation) are: low MNT T9 left/right on the m. thoracic spinalis with a decrease in the LB ROM at W/T13. Low MNT T13 left/right on the longissimus dorsi muscle with a decrease in the DV ROM at T13 /T18 and with a decrease in the FE ROM at T13. Stronger correlations are observed in the caudal part of the back. Low MNT T18 left/right on the m. longissimus dorsi with a decrease in AR and FE ROM at L1/S. Low MNTs L1/L2 and L2/L3 on the supraspinal landmarks with a decrease in FE ROM at L1/S.

**Conclusion**: There are significant correlations between low MNT measurements and reduced ROM at various anatomical sites in Thoroughbreds with back pain. These correlations are most significant on the caudal part of the back and regarding MNT at landmarks on the supraspinal ligament in the lumbo-cranial region.







## **Louise Caplan**

University of Calgary, Faculty of Veterinary Medicine

Exploring the relationship between elevated high-sensitivity cardiac troponin-T (cTnT) and cardiac arrhythmias during chuckwagon racing at the Calgary Stampede

#### **AUTHOR NAME / AFFILIATION**

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- Dr. Renaud LEGUILLETTE | Calgary Chair of Equine Sports Medicine | DMV, MSc., PhD, Dipl. ACVIM, Dipl. ACVSMR (American College of Veterinary Sports Medicine and Rehabilitation) | Faculty of Veterinary Medicine, University of Calgary

#### **ABSTRACT**

Cardiac arrhythmias are the primary cause of sudden death in horses during exercise in cases unrelated to musculoskeletal issues. High-sensitivity cardiac troponin-T (cTnT) is a biomarker used for detecting myocardial damage. This study aims to evaluate the utility of cTnT testing as a practical screening tool to identify racehorses at risk for arrhythmias, without the need for more complex diagnostics such as exercise electrocardiography. Additionally, it aims to determine which factors may influence cTnT levels. While detecting myocardial injury remains challenging, routine cTnT testing could serve as an early warning system for subclinical cardiac issues.

By investigating the association between myocardial injury and the occurrence of arrhythmias, this study seeks to fill a critical gap in our understanding of which horses may be predisposed to potentially fatal cardiac events during racing. For this research, blood samples were collected from the Chuckwagon horses at the 2025 Calgary Stampede 12 hours after their first race to measure cTnT levels. Horses with cTnT levels exceeding 14.0 ng/L were tested after subsequent races (N=500). Outrider horses underwent an exercise electrocardiogram (ECG) using Arioneo Equimetre technology during every race. It was found that working duration, working distance, and humidity were negatively correlated with cTnT levels, as determined by Pearson's correlation test (r=-0.22, r=-0.22 and r=-0.32 respectively). Temperature and cTnT levels had a positive correlation (r=0.40).

The ECGs are currently being analyzed for arrhythmias using Kubios Premium software. In doing so, this research will provide much-needed understanding of the relationship between elevated cTnT and cardiac arrhythmias.









## **Louise Caplan**

University of Calgary, Faculty of Veterinary Medicine

## Fitness tracker parameters associated with myocardial damage during chuckwagon races

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#### **ABSTRACT**

Introfuction: Cardiac arrhythmias are the primary cause of sudden death in horses during competitions in cases unrelated to musculoskeletal issues. High-sensitivity cardiac troponin-T (cTnT) is validated for detecting myocardial damage to identify racehorses at risk for sudden cardiac death. However, risk factors for cardiac sudden death are still unknown. The aim of the present study is to determine which physiological factors may influence cTnT levels in official races.

Methods: Blood samples were collected from all the chuckwagon horses at the 2025 Calgary Stampede 12 hours after their race to measure cTnT levels. Outrider horses volunteered for the study underwent wearable Arioneo Equimetre technology instrumentation during every race. Heart rate (HR), speed (GPS), strides length and frequency (accelerometers) and weather parameters were recorded during races. A total of 64 physiological parameters were analyzed for each recording. A Pearson correlation analysis tested an association between the blood cTnT and fitness tracker parameters collected.

**Results**: A total of 544 recordings matched with a cTnT blood sample were obtained. It was found that working duration, working distance, and humidity were negatively correlated with cTnT levels (Pearson's r=-0.215; p=0.03, r=-0.222' p=0.03 and r=-0.318; p=0.001 respectively). Temperature and cTnT levels had a positive correlation (r=0.401; p<0.0001). The study shows that increased ambient temperatures and faster racing times (by negative working duration association) were associated with increased blood cTnT and increased cardiac myocardial damage. This is the only study collecting extensive wearable parameters during official horse races filling a critical gap in our understanding of fatal cardiac events.





## **Camille Eamon**

University of Calgary, Faculty of Veterinary Medicine

## Assessing Thoroughbred Movement Symmetry in Chuckwagon Racing Using GNSS-IMU Technology

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#### **ABSTRACT**

**Introduction**: Movement symmetry is a key indicator of lameness in horses. In Chuckwagon racing, teams of four thoroughbreds pull a wagon on half-mile dirt tracks over consecutive days. Warmup and cooldowns before and after each race often include trotting, allowing for symmetry assessment using Global Navigation Satellite Systems with Intertial Measurement Units (GNSS-IMU) without disrupting competition routines.

**Methods**: Over ten race days, sixty thoroughbreds from eleven outfits were instrumented with GNSS-IMU loggers (25Hz) placed on the harness at the midline in the cranial/mid thoracic area. Speed, position, acceleration, and rotation data were recorded for warmup, racing, and cooldown. Trotting was identified using speed and vertical acceleration plots. Published algorithms calculated stride-by-stride vertical displacement minimum difference (MnD), upward difference (UpD), and range of motion (ROM). Absolute (mm) and normalized (%ROM) measures were compared between warmup and cooldown using linear mixed models.

**Results**: From 156 trotting measures, mean MnD was 6.2mm (17.6%) in warmup and 6.4mm (19.7%) in cooldown. Mean UpD was 11.3mm (31.7%) for warmup and 12.8mm (38.0%) for cooldown, with UpD% significantly higher post-race (p=0.048). One horse that sustained a catastrophic forelimb fracture had pre-race UpD values between 3.3 (11.4%) and 29.7mm (69.3%), and post-race values between 21.5 (47.8%) and 25.1mm (76.4%). Across 149 measures from other horses, 11 (7-8%) exceeded 24mm (69%) UpD.

**Conclusion**: Post-race trot asymmetry may indicate fatigue or musculoskeletal stress. GNSS-IMU devices offer a practical, non-disruptive tool for early detection of horses that may benefit from additional veterinary evaluation, supporting proactive racehorse management.









## Karelhia Garcia-Alamo

University of Calgary

## Association between back shape and back range of motion in retired racehorses

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#### **ABSTRACT**

Objective assessment of the equine thoraco-lumbo-sacral (T-L-S) region remains limited, contributing to the difficulty of early and accurate pain diagnosis. This highlights the need for an easy-to-use, objective method for measuring back functionality. To address this, we utilized an established approach for measuring and classifying back shape in horses (Flexi ruler), and we assessed whether back shape is associated with back range of motion (ROM).

Seventy-five recently retired Thoroughbred race geldings (aged 3 to 8 years) were recruited. Differential rotational T-L-S ROM was quantified during straight-line and lunge exercise in trot on 3 different surface conditions using a nine-sensor inertial measurement unit system (EquiGait©).

A non-parametric Kruskal-Wallis test was conducted in SPSS (IBM, v29.0) to evaluate associations between back shape (A=Concave; B=Straight; C=Convex) and back ROM. Pairwise post-hoc comparisons (with Bonferroni correction) were performed to identify statistically significant differences between back shape groups, revealing variations in specific patterns of movements.

Lateral bending differed significantly between groups B and C (p=0.015) during straight-line exercise on sand, and during counterclockwise exercise on rubber, in this case showing a trend toward significance between groups A and B (p=0.056). During clockwise movement, axial rotation showed a borderline difference between groups B and A on sand (p=0.052), and a statistically significant difference between the same groups on rubber (p=0.012). These findings suggest that back shape may influence specific aspects of spinal movement under certain exercise directions and surface conditions.





## **Asad Jafri**

University of Calgary

## Racing Career Duration Does Not Influence Hoof or Movement Asymmetry in Thoroughbred Racehorses

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#### **ABSTRACT**

**Introduction**: Recently retired Thoroughbred racehorses consistently training and racing in a clockwise direction show evidence of increased hoof width of their right hooves in both fore and hind limbs. It has not been investigated whether the length of the racing career contributes to accumulating these differences between contra-lateral hooves. This study assessed the relationship between career length and the degree of hoof and movement asymmetry in recently retired Thoroughbreds.

**Methods**: 274 Thoroughbred recently retired racehorses contributed hoof shape and movement symmetry data. Paired t-tests confirmed systematic right–left differences, with mean forehoof width +1.13 mm (right wider) and mean hind hoof width +0.90 mm. 211 horses were grouped into categories based on the number of seasons raced (2 to 5). Hoof width asymmetry (right-left) was assessed between groups using one-way ANOVA. 116 horses underwent gait analysis with inertial measurement units on poll, withers, and pelvis recording vertical displacement during straight-line trot, and calculating asymmetry metrics. One-way ANOVA tested whether movement asymmetry varied between groups.

**Results**: No significant differences in hoof width asymmetry were observed across groups defined by racing seasons (p=0.37-0.80). Similarly, none of the movement asymmetry variables differed significantly across groups (p=0.13-0.97).

**Conclusion:** The findings of this study do not provide supporting evidence for the hypothesis that longer racing careers are associated with increased hoof or movement asymmetry. with no evidence of increasing hoof asymmetry as a function of career length. Routine farrier care likely helped maintain symmetry within the limits of previously reported differences associated with directional racing.





## Emily John



## Atlantic Veterinary College

### Draft horses have similar outcomes as non-draft horses presenting for colic at a referral institute in Atlantic Canada

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#### **ABSTRACT**

**Introduction**: For horses presenting for colic to a referral hospital in Atlantic Canada we aimed to describe clinical findings, diagnosis, treatment and outcome for draft breeds; identify associations between clinical findings, diagnosis, treatment and outcome for draft compared to non-draft breeds; and identify the overall impact of draft breed on mortality.

**Methods**: Retrospective review of equine colic cases presenting to the Atlantic Veterinary College (2004 to 2023). Logistic regression models were used to assess associations between parameters and draft breed and mortality.

**Results**: A total of 721 horse colic events were included in the study; 68 (9.4%) were categorized as draft breeds. Among draft breeds 'large intestine non-strangulating obstruction' was the most frequent diagnosis (30.9%), followed by 'GI-related medical' (23.5%) and 'open' (19.1%). Draft breeds did not significantly differ from non-draft breeds in type of management received (medical and/or surgical). At admission, draft breeds were significantly more likely to have an increased heart rate, elevated abdominal protein, and elevated peripheral blood lactate, total protein and fibrinogen concentrations. Fifty-nine percent of draft breed cases and 75% of non-draft breed cases survived until discharge. In multivariable analysis, draft breeds did not significantly differ from non-draft breeds in survival.

**Conclusions**: Although colic-presenting draft breeds were more likely than non-draft breeds to present with variables associated with non-survival, after adjusting for other variables draft breed status was not an overall predictor for non-survival at this referral institution.







## **Quinn Kisilevich**

University of Calgary

## Validating a Fitness Tracker in Swimming Horses for Underwater Single Lead ECG and Heart Rate Variability Analysis

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#### **ABSTRACT**

#### Objective

To validate a single-lead ECG fitness tracker device, the Equimetre, against the reference multi-lead ECG recording device, the Televet, for heart rate (HR) and heart rate variability (HRV) monitoring of horses during routine swimming.

#### Methods

Forty race-fit thoroughbred racehorses were used. Surface ECG recordings were obtained simultaneously from the Equimetre and Televet devices in horses swimming 63.65 m across a pool. Electrocardiograms were reviewed, artefacts corrected when necessary, and comparisons made between the two devices for HR and HRV parameters. Descriptive statistics and Bland-Altman tests were used to determine the agreement between data generated from the two devices.

#### Results

A very strong correlation with negligible bias was observed for HR (r = 0.99) between the two devices. The Root Mean Squared Error (RMSE) calculated for HR between them was 0.28 bpm. A strong correlation for the HRV parameters SDRR, HRV TI, TIRR, SD2, SD2/SD1, and DFA 1 was observed between the two devices. However, all HRV parameters except TI had additional variability and bias for the Equimetre device when compared to the Televet. This was suggestive of a need to perform additional testing to validate the Equimetre for assessment of HRV parameters.

#### Conclusion

The Equimetre and the Televet can be used interchangeably for HR monitoring in swimming horses. The HRV parameters during swimming showed bias and variability that increased as the HRV values increased





## Kathleen MacMillan

Atlantic Veterinary College

Investigation of the occurrence of low thyroxine levels and response to thyrotropin-releasing hormone using equine and canine assays in a population of Standardbred racehorses in Prince Edward Island, Canada

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#### **ABSTRACT**

Primary hypothyroidism is rare in horses yet decreased total T4 (tT4) concentrations are frequently observed in racing Standardbred horses lacking clinical evidence of hypothyroidism. Owners frequently wish to provide these horses with low tT4 measurements with thyroid supplementation. Baseline tT4 concentrations of 40 actively racing Standardbreds were measured using human-based (equine) and canine-based chemiluminescent assays. Dynamic evaluation of tT4 was performed using a thyrotropin-releasing hormone (TRH) stimulation test using both assays. Equine assay mean baseline tT4 was 15.1 nmol/L. 31/40 (77.5%) concentrations were below the reference interval and had a mean post-TRH tT4 concentration of 27.5 nmol/L (SD = 6.1) and mean percentage increase of 113.6% (SD = 47.4). Only 3 of these horses did not reach a 50% increase in TRH although they all increased from baseline. Canine assay mean baseline tT4 concentration was 17.9 nmol/L. 12 of 40 (30%) concentrations were below the reference interval and had a mean post-TRH tT4 concentration of 36.7 nmol/L (SD = 5.8) and mean percentage increase of 242.7% (SD = 91.7). The 31 horses identified with low baseline tT4 concentrations using the equine assay achieved a 50% or greater increase from baseline using the canine assay. Equine and canine assay-derived values (for baseline and post-TRH tT4) were strongly correlated, with weak concordance correlation coefficients. Results from this study support that a single low tT4 concentration cannot be used to accurately diagnose hypothyroidism in horses and dynamic testing is required. Further evaluation of the canine assay for equine application is recommended.





## **Shannon Massie**

University of Calgary

Ultrasound-guided injection of Bupivacaine into the cricoarytenoid dorsalis muscle as a novel technique for transiently inducing laryngeal hemiplegia in horses

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#### **ABSTRACT**

**Introduction**: In clinical research, laryngeal hemiplegia (LH) is induced by temporarily supressing recurrent laryngeal nerve function; however, the technique is challenging. The aim was to develop a novel method to induce LH by injecting Bupivacaine directly into the cricoarytenoid dorsalis muscle (CADM) under ultrasound guidance.

**Methods**: Part 1: A high-frequency linear ultrasound probe was used to inject Methylene Blue into the CADM of five cadaver larynges. Part 2: Eight Thoroughbred racehorses with normal laryngeal function were clipped and aseptically prepped on the left side of their larynx. Ultrasonography was used to identify the thyroid cartilage and trace it dorsolaterally until the cricoarytenoid lateralis muscle was visible. The CADM was visualized by rotating the probe 90-degrees while extending and bending the horse's head laterally and simultaneously pressing the right side of the larynx medially. A 20G 3.5-inch needle was inserted and guided by ultrasonography into the left CADM and Bupivacaine (4.5ml) was injected. The efficiency and duration of the block was assessed at rest (n=10 trials) and during maximal exercise on a track (n=10 trials) using overground endoscopy and validated grading systems.

**Results**: Cadaver studies confirm ultrasonography can be used to successfully inject the CADM. LH was induced in 8/10 trials at rest (Grade-3=1; Grade-4=7) and exercise (Grade-B=1; Grade-C=6; unconfirmed Grade=1) in as little as one-minute post-injection. Normal laryngeal function was restored within 1-hour.

**Conclusion**: Injecting Bupivacaine directly into CADM under ultrasound guidance is a practical technique for inducing transient LH that is sustainable during maximal exercise.







## **Leonardo Parra**

University of Guelph

#### Diagnostic and Prognostic Value of Peritoneal Lactate, Albumin, Their Ratios and differences for Intestinal Ischemic Injury in horses

#### **AUTHOR NAME / AFFILIATION**

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#### **ABSTRACT**

Several biomarkers have been previously investigated as predictors of the need for exploratory celiotomy and prognosis for survival in horses with acute abdomen (colic).

This study investigates the association between select peritoneal fluid biomarkers and their predictive value for surgical intervention and survival to discharge in horses admitted for colic. Peritoneal fluid samples (n=69) collected from horses referred to OVC-HSC for evaluation of colic were used. Peritoneal lactate (PLF), blood lactate (BL) and total solids (TS) were measure on admission and albumin (Alb) levels were measured at the diagnostic laboratory.

Normality of the data was assessed using the Shapiro wilk test, and the association between the continuous variables with the two different binary outcomes; surgery (yes or no) and survival (yes or no) with Student T test. Receiving operator curves (ROC) were used to evaluate the performance of the predictive variables with the two different outcomes.

For strangulating obstructions (n = 48), predictors were PFL, Alb and DifPFL/BL, with AUC of 67%; 66.5% and 73.8%, respectively. A cutoff point of 2.8 PLF, 11.5 g/L Alb, and 0.9 yielded a sensitivity of 85.4, 85%, 88.9% and specificity of 46.4%, 53.6%, 60.9, respectively.

For survival outcome (n=30), predictors were: The DifPFL/BL, PFL, Alb, DifTS/Alb with AUC 76.5%, 78.4%, 68.9%, 71.8%, a cut off of 1.8mmol/L PFL, 4.7mmol/L, 15.5g/L Alb, 10.5g/L TS and sensitivity of 77.3%, 76.7%, 66.7%, 53.3%, and specificity of 75%, 69.2%, 71.1%, 81.6%, respectively.

The PFL levels and ratios with other biomarkers may be useful predictive indicators and warrant further investigation.







## Erika Sjolin

Ontario Veterinary College

Seroprevalence of Sarcocystis neurona and Neospora hughesi in healthy horses from the province of Alberta, Canada

#### **AUTHOR NAME / AFFILIATION**

- Erika Sjolin
- Angelica Galezowski
- Luiza S. Zakia
- Ashley Whitehead

#### **ABSTRACT**

Equine protozoal myeloencephalitis (EPM) is a neurologic disease known to be caused by Sarcocystis neurona, and Neospora hughesi. Historically, EPM has not been considered as a differential diagnosis for neurologic horses in Alberta, as the province is outside of the natural range of the opossum (Didelphis virginiana). However, there have been no studies investigating the seroprevalence of EPM agents in Albertan horses.

In this cross-sectional study, 116 serum samples were submitted for immunofluorescent antibody testing (IFAT) and enzyme-linked immunosorbent assay (ELISA) to determine the anti-S. neurona and anti-N. hughesi antibody levels. A subset of samples were also submitted for S. neurona western blot (WB). Samples were obtained from healthy non-neurological horses that always resided in Alberta, based on owner reporting.

Descriptive analysis, true and apparent prevalences, and kappa agreements were calculated. In addition, a Bayesian latent class model (BLCM) was performed to estimate the sensitivity and specificity of three diagnostic tests (ELISA, IFAT, and WB) for S. neurona in the absence of a reference standard.

Overall, there was a higher-than-expected seropositivity rate. The seroprevalence of anti-S. neurona antibodies was 28.4% (33/116; IFAT), 9.5% (11/116; ELISA), 16.7% (5/30; WB). The seroprevalence of anti-N. hughesi was 27.6% (32/116; IFAT), 17.3% (20/116; ELISA). It is unclear if the presence of anti-protozoal antibodies in the sample population is due to S. neurona and N. hughesi exposure from expansion of the definitive host range or due to cross-reactivity of the test with antibodies for similar protozoal species known to be present in Alberta.







## Matthijs van den Broek

University of Calgary & Delft University of Technology

Stride phase relationship between pairs of Thoroughbred chuckwagon horses: a preliminary study

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#### **ABSTRACT**

Motivation: In Chuckwagon racing four Thoroughbred horses (an 'outfit') together pull a chuckwagon around a racetrack. Although individual Chuckwagon horses have been studied, little is known about the coordination between horses. This study investigated the stride phase relationship between Chuckwagon horses during barrel turning.

Methods: Seven chuckwagon outfits were fitted with GNSS sensors synchronized by UTC time to identify stride cycles. The phase relationship between left-right pairs of horses was categorized as (not) out-of-phase for three 'exercise types': full effort (accelerative) barrel turns, practice (non-accelerative) barrel turns, and 'on-track' gallop. Phase differences in GNSS speed traces between 90° and 270° (and standard deviation <50°) were categorized as 'out-of-phase'. A chi-squared test (P<0.05, Bonferroni correction for pairwise comparisons) compared the number of left-right horse pairs exhibiting (not) out-of-phase patterns per exercise type.

Results: Eleven of 14 left-right pairs (7 pairs of leaders, 7 pairs of wheelers) indicated out-of-phase strides for accelerative barrel exercise, 4 of 14 for non-accelerative barrel exercise and 3 of 14 for on-track exercise with a significant difference between the three exercise types (P=0.004). Pairwise comparisons showed that accelerative barrel exercise was statistically different from non-accelerative barrel exercise (P=0.008) and on-track exercise (P=0.002). There was no significant difference between non-accelerative barrel and on-track exercise (P=0.663).

**Conclusion**: Preliminary data from a limited number of Chuckwagon outfits indicate that during maximum effort accelerative exercise, left-right pairs of horses are more likely to be out-of-phase, indicating an alternating pattern of acceleration and deceleration between horses of a left-right pair.







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#### **ABSTRACT**

Motivation: Recent evidence suggests that Thoroughbred racehorse stride parameters have predictive value for musculoskeletal injury [1]. However, before patterns indicative of potential injury can be signalled, a baseline of normal stride parameters for varying circumstances, in this case focusing on racetrack curvature for wagon-pulling Chuckwagon horses, needs to be established.

Methods: Twenty-eight Thoroughbred Chuckwagon horses were fitted with GNSS sensors, quantifying speed, stride length and frequency along the racetrack. Data from training sessions with speeds exceeding 10 m/s were partitioned in 100m-sections. Average speed, stride length and frequency, and track curvature (categorized into straight, straight-curve transition, and curve) were calculated per 100m-section. A linear mixed model with curvature category and speed as fixed factors, and horse as random factor, was created in SPSS (p<0.05 with 95% confidence intervals) to assess their association with stride parameters.

Results: For stride length a significant association with speed (+0.222+0.005m per m/s, p<0.001) and track curvature (-0.074+0.017m for straight-curve transition, -0.134+0.019m for curve, p<0.001) was found. For stride frequency a significant association with speed (+0.083+0.002 Hz per m/s, p<0.001) and track curvature (+0.030+0.006 Hz for straight-curve) transition, +0.051+0.006 Hz for curve, p<0.001) was found. There was no significant association between track curvature and speed (p=0.760).

Conclusion: A linear mixed model has been created for stride parameters based on speed and racetrack curvature for Thoroughbred chuckwagon horses considered "fit to compete". This could be used as a starting point for more elaborate models incorporating quantitative surface characteristics and other racing conditions.



1. Wong et al. https://doi.org/10.1111/evj.13581







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## Impact of Hoof Trimming on Hoof Shape and Gait Symmetry in Barefoot Horses

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#### **ABSTRACT**

**Introduction**: Hoof trimming is a routine task undertaken at regular intervals and is associated with changes in hoof shape, which in turn influence gait kinetics and kinematics. Subtle asymmetries in hoof shape and/or gait, which can now be measured easily with ready-to-use technical aids, may signal early musculoskeletal problems. The aim of this study was to quantify changes in hoof shape and associated gait changes post-trimming in barefoot horses.

**Methods**: Fourteen routinely trimmed university-owned barefoot horses were included. Fifty sets of pre- and post-trimming photographs were collected across multiple trimming cycles from solar, lateral, and dorsopalmar views on all four hooves. Calibrated photographs were processed to obtain hoof measurements. In addition, 29 sets of pre- and posttrimming gait videos were analyzed using Al-based gait analysis (Sleip) to measure gait asymmetry. Linear mixed models with trimming status (pre/post) as a fixed effect and horse as a random effect were tested for significant differences.

**Results**: Across limbs, foot width decreased by an average of 5.15 mm (p=0.02), heel height by 2.9 mm (p<0.01), and splay (%) decreased by 9.46% (p<0.01). Other hoof measurements, including dorsal hoof wall angle (p=0.19) and heel angle (p=0.34), did not change significantly. No significant changes were observed in forelimb and hindlimb movement asymmetry (p=0.12-0.59).

Conclusions: Routine trimming resulted in consistent and measurable changes in hoof conformation. However, straight-line trotting gait symmetry remained unchanged, suggesting routine barefoot trimming alone may have minimal impact on movement asymmetry.





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# Thank You!

