

2024

# EQUINE RESEARCH REPORT

Scientific studies conducted to help advance equine health and well-being



**LSU** | School of  
Veterinary Medicine

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EQUINE HEALTH AND  
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CENTER OF EXCELLENCE



# administration

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Our Mission: The LSU Equine Health and Sports Performance (EHSP) program will become a premier equine biomedical center in the 21st century through leading-edge research of equine diseases, contemporary instruction of professional veterinary students and veterinarians in advanced studies programs, and enhanced continuing education of the horse-owning public and private equine practitioners, with the ultimate goal of providing state-of-the-art diagnostic and therapeutic capabilities for critically ill and injured horses, and optimal clinical service to horsemen in Louisiana and the surrounding region.

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**We  
Teach.  
We  
Heal.  
We  
Discover.  
We  
Protect.**

*One of our many services is osteopathy, which is a holistic and manual therapy that focuses on identifying and treating mobility restrictions of all the structures of the body.*





## Delivering on our missions

**THE DEPTH AND  
BREADTH OF  
EXPERTISE WE  
HAVE IN EQUINE  
CLINICAL PRACTICE  
AND RESEARCH IS  
OUTSTANDING.**

**C**hange is in the air – and it is all around us!

Since my arrival as dean of the LSU School of Veterinary Medicine, I have been constantly impressed by the compassion, commitment, and competence of those students, staff, and faculty who call our fine school home. We have world class programs delivered by the people we are honored to call colleagues in each of our missions of teaching, healing, discovering, and protecting. The depth and breadth of expertise we have in equine clinical practice and research is outstanding, and it shows through the pages of this impactful publication. It is my unbridled pleasure to be making some introductory remarks on this wonderful program that we have re-branded “Equine Health & Sports Performance (EHSP),” which so ably serves the \$2.5B equine industry in the state of Louisiana. The impact of this program on the nation and the world is no less impressive.

Delivering on each of our missions, the EHSP continues to embrace the full spectrum of equine internal medicine, surgery, dermatology, ophthalmology, emergency medicine, critical care, and sports performance, teaching our students and house officers as well as serving the clinical needs of the equine community throughout the state. We are also proud to offer excellent diagnostic imaging and other modalities to serve your needs, with both computed tomography and magnetic resonance imaging for sports injuries available to our equine patients. We offer platelet-rich plasma and stem cell therapy, as well as dynamic endoscopy and treadmill evaluation of exercising horses.

Our equine research continues to deliver in spectacular fashion too. You will find ample evidence of the impact of our EHSP in the pages of this publication. We have a

diverse team of staff and faculty who deliver translational, clinically relevant research in such areas as orthopedics, gastroenterology, and stem cell therapy. We have a laboratory accredited to Good Laboratory Practice standard, able to deliver pharmacological research for Food and Drug Administration approval. The EHSP is also home to the Laboratory for Equine and Comparative Orthopedic Research, a powerhouse of scientific mentorship, discovery, and translation of science into practical solutions for debilitating injuries and diseases of horses. The EHSP has diverse funding for its work, including corporate sponsors, the Grayson Jockey Club Research Foundation, the American Association of Equine Practitioners Research Foundation, the American College of Veterinary Surgeons, and more.

Finally, it would be remiss of me not to mention the critical function EHSP plays in protecting horses and the equine industry in Louisiana, not only during natural disasters but also in more temperate times. A recent example of the impact of our work was in the diagnosis of botulism in several horses following the consumption of contaminated alfalfa cubes.

So, whether your interest is teaching, healing, discovering, or protecting, this publication – a beautiful showcase of the spectrum of EHSP activities – has something for you. I invite you to dip into the magazine, read whatever piques your interest, and to reach out to us if you wish to tour our fine School of Veterinary Medicine to learn more about our equine programs, or have any other queries.

We are here to serve, and we could not be more delighted to engage our colleagues, clients, and diverse stakeholders throughout the state of Louisiana and farther afield.

With my warmest regards,



## Focusing on Equine Health and Sports Performance

**THE EHSP TEAM  
CONTINUES  
TO PRODUCE  
HIGH QUALITY  
BIOMEDICAL  
RESEARCH, ADDRESS  
HORSE HEALTH  
AND WELFARE, AND  
DISSEMINATE THAT  
INFORMATION**

**A**s Director of the Equine Health and Sports Performance (EHSP) program, it is my pleasure to present the 2024 Equine Research Report from the

LSU School of Veterinary Medicine. Since the program's initial funding in 2005, the program has remained strong and carries on the original mission of improving the health and well-being of horses. However, as our new Dean states in his Dean's Welcome Note, we are rebranding ourselves to reflect our continued mission. We will still be known as the EHSP, however we are now "Equine Health & Sport Performance." We continue to deliver state-of-the-art medical and surgical treatment, with the addition of an emphasis on sports performance.

Since our last Equine Research Report, Dr. Laura Riggs has become board certified in sports medicine and rehabilitation through the American College of Sports Medicine and Rehabilitation. Since her board certification, she has taken on a resident who will train in this and other areas. This is an exciting new branch of our program that further supports the \$2.5 billion Louisiana Horse Industry. Despite the name change, the world class EHSP team remains committed to the health, well-being, and performance of horses through veterinary research, education and clinical and public service, and I congratulate the contributors to the program.

The EHSP team continues to produce high quality biomedical research, address horse health and welfare, and disseminate that information to the local, state, regional and worldwide stockholders.

The EHSP team continues to contribute to the LSU Vet Med missions to teach, heal, discover, and protect. The EHSP faculty teaches in the classroom and in our multiservice equine hospital. For our excellence in teaching, our faculty have received Dean's Teaching Merit Awards. In addition, you will find a section in this report noting our Phi Zeta Research Presentations and the Summer Scholars program, funded by Boehringer Ingelheim and the NIH. These vital programs allow our faculty to teach students in proper research techniques and for the students to receive important training in cutting-edge equine biomedical research.

The EHSP team "discovers" via diverse research interests with one major goal: to improve the health and welfare of the horse. Investigators represented in this report contributed information in the areas of equine surgery, gastrointestinal disease (colitis and gastric ulcer disease), laminitis, reproduction, respiratory disease and lameness. Each study in this report benefits the horse and the equine industry and shows how we "heal" by identifying essential mechanisms of disease, groundbreaking new treatments, essential techniques in reproduction, and essential information to prevent diseases.

Many of the studies found in this report were presented at local, regional, national and international meetings, including the American Association of Equine Practitioners, American College of Veterinary Surgery, American College of Veterinary Internal Medicine annual forum, Colic Research Symposium, Havemeyer Workshops, British Equine Veterinary Association Congress, Veterinary Orthopedic Society, EPM Society, Applied Equine Nutrition and Training Conference, International Equine Infectious Disease Conference and American Society of



Animal Science. EHSP researchers continue to be sought-after board members to review grants, present at state, regional, national and international meetings and asked to present keynote speeches.

The biomedical research outlined in this report and state-of-the-art facilities on campus are the result of continued support from the Louisiana Governor's Biotechnology Initiative Grants Program, Louisiana Board of Regents Enhancement Grants Program and a statutory dedication from the Louisiana racetrack slot machine tax revenues. This state funding provides program with technical support and intramural funds to generate pilot data that leads to extramural funding from outstanding granting institutions like the Grayson Jockey Club Research Foundation, Morris Animal Foundation, Pennington Biomedical Research Foundation, United States Department of Agriculture, National Institutes of Health, and our industry partners, including Boehringer Ingelheim Animal Health, SmartPak® Equine, LLC, Darling Ingredients (Sonac), Dechra, The High Bush Blueberry Council, W.F. Young, Inc., Purina Animal Health, among others.



Lastly, the EHSP is dedicated to “protecting” the horses of Louisiana, the region and nation. As mentioned in Dean Garden’s welcome message, the EHSP played a critical in discovering and protecting local horses from the devastating disease, Botulism. By rapidly diagnosing cases presented to LSU Equine, faculty of the EHSP were instrumental in discovering that alfalfa cubes purchased from a single source in Colorado was the culprit. This no doubt saved countless horses’ lives both locally and nationally, as the FDA was able to recall the hay cubes. The EHSP also protects the horses of Louisiana and Dr. Mustajab Mirza with the EHSP team are heavily involved in training of first responders and responding to natural disasters, whenever they occur. Dr. Mirza recently received the prestigious Louisiana Veterinary Medical Association Service Award.

I want to take this opportunity to thank the many donors to LSU Equine. Our program is enriched with these generous contributions from horse owners and horse lovers. These funds provide value added services to the more than 80 rescued Thoroughbreds in our herd. In addition, I would like to thank the research associates, undergraduate and professional student workers and many summer scholar students, that without their help we would not be able to fulfill our mission and bring you this report.

That being said, we owe our deepest gratitude to the horses and ponies in the EHSP herd! The information presented in this report would not have been possible without the availability and use of these horses. All biomedical research on animals at LSU is conducted under Federal Guidelines for the Humane Care and Use of Animals and approved by the LSU Institutional Animal Care and Use Committee. These horses are valued members of our family and treated with kindness and dignity.



**Research  
is a  
cornerstone  
of our  
mission**

**T**

he LSU School of Veterinary Medicine pursues cutting-edge research in equine health and sports medicine and is recognized as one of the top equine research programs in the country. Our Equine Health and Sports Performance (EHSP) program supports research efforts to discover novel therapies, including stem cell therapies and technologies for improving equine reproductive health, and investigates mechanisms of equine diseases such as laminitis, equine gastric disease, osteoarthritis, sepsis, protozoal myeloencephalitis, and equine viral arteritis.

**THE RESEARCH  
EFFORTS OF  
OUR FACULTY  
CONTRIBUTE  
TO OUR PUBLIC  
SERVICE, AS WELL  
AS OUR MISSION  
TO TRAIN THE  
NEXT GENERATION  
OF EQUINE  
VETERINARIANS**

It also supports research in pain identification and management, wound healing, and in the biomechanics of fracture repair. Our faculty conducts this research with intramural funding from the EHSP and LSU Vet Med, as well as extramural funding from numerous agencies and industry partners. We are grateful for the support received from the National Institutes of Health, USDA, Equine Health Appropriations from the State of Louisiana, Grayson Jockey Club Research Foundation, Boehringer Ingelheim Animal Health, European College of Zoological Medicine, Theriogenology Foundation, ACVO Vision for Animals Foundation, Randlab, Sentrx Animal Care, Tend Health, LLC, and Southeast Veterinary Education Consortium, just to name a few!

The research efforts of our faculty contribute to our public service, as well as our mission to train the next generation of equine veterinarians. We applaud the efforts of our faculty contributing to the EHSP who strive to ensure that equine health remains a top priority for the LSU Vet Med.

## Faculty

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**Frank M. Andrews**, DVM, MS, DACVIM, LVMA Equine Committee Professor, Director of the Equine Health and Sports Performance (EHSP) program, and Head of Veterinary Clinical Sciences

Dr. Andrews received his DVM and MS from Washington State University in 1983. He completed one year in private practice at Associated Veterinary Clinics, Inc. in Walla Walla, Wash., and completed a large animal internal medicine residency in 1988 at The Ohio State University College of Veterinary Medicine. Dr. Andrews became a Diplomate of the American College of Veterinary Internal Medicine in 1989 and was on the faculty at the University of Tennessee College of Veterinary Medicine from 1988-2008. His research focuses on investigating treatment and prevention of gastric ulcer disease, gastric emptying and gastrointestinal motility, and diagnosis and treatment of pituitary par intermedia dysfunction (Equine Cushing's Disease).

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**Rose Baker**, BVMS, MS, DACVIM-LA, Associate Professor of Equine Medicine, Veterinary Clinical Sciences

Dr. Baker is an assistant professor of equine medicine in the Department of Veterinary Clinical Sciences. She joined the faculty on September 21, 2017. She received her BA from Johns Hopkins University in 2005. She received her BVMS from the University of Glasgow in 2012 and her cVMA from the CuraCore Integrative Medicine & Education Center in 2014. Dr. Baker received her MS from Oregon State University in 2017. She completed an equine medicine and

surgery internship at North Carolina State University in 2013 and then completed a large animal clinical fellowship in 2014 followed by a large animal medicine residency in 2017, both at Oregon State University. Dr. Baker's teaching interests are in emergency and critical care, equine neurological disorders, and helping students develop proficiency in clinical and communication skills. Her research interests are in equine critical care (specifically monitoring techniques to improve assessments of patient response to treatment) and equine gastroenteric diseases.

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**Udeni Balasuriya**, BVSc, MS, Ph.D., FSLCVS, Associate Dean for Diagnostic Operations, Director, Louisiana Animal Disease Diagnostic Laboratory, and Professor, Pathobiological Sciences

Dr. Balasuriya received his veterinary degree from the University of Peradeniya, in Sri Lanka. He then joined the Veterinary Research Institute as a Research Officer and became involved in disease diagnosis and surveillance. He came to the United States as a Fulbright Scholar and completed a Master's and Ph.D. degree in Comparative Pathology (diagnostic pathology and molecular virology) University of California, Davis. He joined the faculty at the Maxwell H. Gluck Equine Research Center (GERC), Department of Veterinary Science, at the University of Kentucky in August 2005. He was awarded the Jes & Clementine Schlaikjer Professorship in Equine Infectious Diseases in the Department of Veterinary Science. Dr. Balasuriya is currently Director

of the Louisiana Animal Disease Laboratory, School of Veterinary Medicine, Louisiana State University, Baton Rouge, LA. His research focus includes characterizing the molecular epidemiology and pathogenesis of equine arteritis virus (EAV) and equine herpesvirus-1 (EHV-1) infections and development of improved vaccines to prevent infection.

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**Heidi Banse**, DVM, Ph.D., DACVIM, Associate Dean for Educational Strategy and Associate Professor of Equine Medicine, Veterinary Clinical Sciences

Dr. Banse joined the faculty on August 17, 2017. She received her BS in 2004 and her DVM in 2007, both from Washington State University. She completed a large animal internship at the University of Georgia in 2008 and an equine medicine residency at Oklahoma State University in 2011. She received her Ph.D. from Oklahoma State University in 2013. She then spent four years on faculty at the University of Calgary in Alberta, Canada. Dr. Banse is a Diplomate of the American College of Veterinary Internal Medicine (Large Animal). Her teaching interests are in equine endocrinology and pharmacology and her research focus is in equine gastric disease and equine endocrinology.

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**Renee T. Carter**, DVM (LSU 2000), DACVO, Professor of Ophthalmology, Veterinary Clinical Sciences

Dr. Carter received her DVM from LSU Vet Med in 2000 and completed a rotating internship in small animal medicine and surgery at LSU Vet

## Faculty

Med in 2001. She completed a four-year comparative ophthalmology residency and fellowship at the University of Madison-Wisconsin in 2006 and returned to LSU as an assistant professor. Dr. Carter became a Diplomate of the American College of Veterinary Ophthalmologists in 2007 and her research focuses on corneal wound healing disorders and the role of leptospirosis in the pathogenesis of equine recurrent uveitis.

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**Ann Chapman, DVM (LSU 2001), MS, DACVIM, Associate Professor of Equine Medicine, Veterinary Clinical Sciences**

Dr. Chapman was born and raised in Harrisburg, Penn. She received her BA in biology from Gettysburg College in 1990 and worked in laboratory research in both government and private sectors. She received her DVM from LSU Vet Med in 2001. After working in private practice for one year, she began her combination equine internal medicine residency/graduate program at LSU Vet Med in 2002. Dr. Chapman completed her residency in 2005 and became a Diplomate of the American College of Veterinary Internal Medicine. She received an MS in 2006 from LSU Vet Med. She performs mobile equine medicine consultation throughout Louisiana and equine ambulatory medicine to the Baton Rouge community. Her research interests include endocrine diseases, pars intermedia pituitary dysfunction (PPID), equine cardiology, and infectious disease, especially Salmonella detection and prevention. Dr. Chapman is also section chief of

the Equine Ambulatory Service, which provides general specialty services to Baton Rouge, the region and the State of Louisiana.

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**Shafiqul Chowdhury, DVM, MS, Ph.D., Professor, Pathobiological Sciences**

Dr. Chowdhury received his DVM and MS degrees from Bangladesh Agricultural University (Bangladesh) and a Ph.D. from the Goethe Institute (Germany). He completed a post-doctoral fellowship in the Department of Microbiology at the University of Texas Health Sciences Center in Houston, Texas. Dr. Chowdhury was a research scientist at Bayer Animal Health and was on the faculty at Kansas State University College of Veterinary Medicine for 18 years before coming to LSU in 2008. His research interests include gene characterization and vaccine development for Equine Herpes Virus 1 and Bovine Herpes Virus 1. He has received and completed several USDA grants and works closely with industry.

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**Jeannette Cremer, DVM, Dr.med. vet., DACVAA, Associate Professor of Anesthesiology, Veterinary Clinical Sciences**

Dr. Cremer received her DVM in 2003 and her Dr.med.vet. in 2005, both from Ludwig Maximilians University (Germany). She is a Diplomate of the American College of Veterinary Anesthesia and Analgesia. Dr. Cremer completed her anesthesia residency at the University of Georgia in 2011. She joined the faculty of LSU Vet

Med in 2014. Dr. Cremer's research interests are in the evaluation of learning competencies, validation of teaching methods, influence of computer based learning, and analgesic techniques.

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**Noelia Diaz Falcon, LV, MS, DACVAA, Assistant Professor, Veterinary Clinical Sciences**

Dr. Diaz Falcon joined the LSU Vet Med faculty in September 2021. Her research interests are in hemodynamic measurements and pain assessment in small and large animals, and her clinical interests are in the effect of different sedatives in horses for premedication, dysphoria induced by opioids in dogs, the outcome of different inhalants in puppies after emergency C-sections, and the quality of recovery in horses using different alpha 2 adrenergic receptors constant rate infusions.

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**Levent Dirikolu, Ph.D., Professor, Comparative Biomedical Sciences**

Dr. Dirikolu joined the faculty in January 2016. He received his DVM from Ankara University (Turkey) in 1992, his MVSc and his Ph.D., both from the University of Kentucky in 2001. He completed a post-doctoral fellowship in veterinary pharmacology from the University of Kentucky in 2002.

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**Joseph Francis**, BVSc, MVSc, Ph.D., Professor, Comparative Biomedical Sciences

Dr. Francis joined the faculty in 2003. Dr. Francis received his BVSc in 1990 and his MVSc in 1994, both from the Madras Veterinary College in India. He received his Ph.D. from Kansas State University in 1999. His research focuses on the brain mechanisms regulating cardiovascular function, specifically the understanding of the central nervous system interactions of cytokines renin-angiotensinaldosterone system in heart failure. He is also conducting research on the benefits of blueberries and the effects of exercise.

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**L. Abigail Granger**, DVM, MS, DACVR, Professor of Diagnostic Imaging, Veterinary Clinical Sciences

Dr. Granger received her DVM from the University of Tennessee and completed a radiology residency. She is a Diplomate in the American College of Veterinary Radiology. Her teaching interests include radiographic interpretation, ultrasound performance and interpretation (basic, intermediate, and expert), and research methods. Her research interests include functional CT, thoracic CT with emphasis on airways and interstitial disease, ultrasound in endocrine diseases, and correlation of ultrasound with pathological findings. Dr. Granger is also the service chief for LSU Vet Med Diagnostic Imaging Service.

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**Samithamby Jeyaseelan**, DVM, Ph.D., Professor, Pathobiological Sciences

Dr. Jeyaseelan received his DVM degree from the University of Peradeniya (Sri Lanka) in 1992. He received his Ph.D. in pulmonary immunology from the University of Minnesota College of Veterinary Medicine in 2001. He completed his first post-doctoral training at Yale University in pulmonary immunology in 2003 and his second post-doctoral training at National Jewish Health/Colorado Health Sciences Center in lung biology in 2004, where he was also on the faculty from 2004-07. In addition to being a professor in PBS, Dr. Jeyaseelan is also the director of the NIH-funded COBRE Center for Lung Biology and Disease. He also serves as the Dr. William L. Jenkins Endowed Professor in veterinary Medicine. His research focuses on investigating the mechanisms underlying lung inflammation and host defense in response to bacterial pathogens. Dr. Jeyaseelan has published more than 50 original articles and more than 16 review articles. He has served as an associate editor of the Journal of Immunology, serves as an academic editor of PLoS One and serves on the editorial boards of American Journal of Respiratory Cell and Molecular Biology and Shock. Dr. Jeyaseelan's research is primarily funded by the National Institutes of Health.

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**Britta Leise**, DVM (LSU 2002), MS, Ph.D., DACVS, Associate Dean for Faculty and Staff Advancement

and Associate Professor of Equine Surgery, Veterinary Clinical Sciences

Dr. Leise received her undergraduate degree from Virginia Tech in animal sciences and from there went to Louisiana State University where she received a Master's degree in equine reproductive endocrinology. In 2002, she graduated from LSU Vet Med. She then completed an internship at the University of Georgia in large animal surgery and medicine. Dr. Leise returned to Baton Rouge where she completed a residency in equine surgery and became a Diplomate of the American College of Veterinary Surgeons in 2008. She was a clinical instructor in equine emergency and critical care at The Ohio State University from 2007 until 2010, where she completed her Ph.D. in Comparative and Veterinary Medicine with a focus on the role of inflammation and the epithelial cell in equine laminitis. From there Dr. Leise became faculty at Colorado State University from 2011-2015 as an assistant professor of equine surgery and lameness. She returned to LSU in October 2015 as assistant professor of equine surgery. Her research interest includes equine laminitis, wound healing, and inflammatory conditions in the horse.

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**Andrew Lewin**, BVM&S, DACVO, Associate Professor of Ophthalmology

Dr. Lewin graduated from the University of Edinburgh in 2010 as a veterinarian and has since worked in the UK, New York, Wisconsin and Louisiana. He is certified by

## Faculty

the American College of Veterinary Ophthalmologists. His research interests include ocular infectious disease, next-generation sequencing, and clinical veterinary ophthalmology.

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**Mandi J. Lopez, DVM, MS, Ph.D., DACVS, Professor, and Director of LECOR, Veterinary Clinical Sciences**

Dr. Lopez received her BS from Humboldt State University in Arcata, Calif., and her DVM from the University of California-Davis. She completed a food animal internship at Kansas State University prior to going to the University of Wisconsin, where she completed a residency in large animal surgery and obtained MS and Ph.D. degrees. She then did a post-doctoral fellowship in applied biomechanics. Her areas of interest are tissue regeneration, orthopedic surgery, laminitis, and joint diseases. Dr. Lopez has expertise in both applied and basic research, holds several patents for biomedical devices, and she is a diplomate of the American College of Veterinary Surgeons. She came to LSU in 2004 and directs the Laboratory of Equine and Comparative Orthopedic Research (LECOR).

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**Aliya Magee, DVM (LSU 2009), MS, DACVIM (Cardiology), Assistant Professor, Veterinary Clinical Sciences**

Dr. Magee received her DVM from LSU Vet Med in 2009 and MS from Purdue University School of Veterinary Medicine in 2013. She completed a Cardiology residency at Purdue University and is board

certified in the American College of Veterinary Internal Medicine, Cardiology. Her clinical and research interests include comparative cardiac disease.

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**Charles T. “Chuck” McCauley, DVM, MS, DABVP, DACVS, Assistant Professor of Equine Surgery, Veterinary Clinical Sciences**

Dr. McCauley joined the equine faculty at LSU Vet Med in 2006. Prior to that, he was employed in a busy private referral practice in northeast Texas. He received his DVM from Texas A&M University and completed an internship and residency in food animal medicine and surgery at Oklahoma State University. He also completed a residency in large animal surgery (equine emphasis) at Purdue University. He is a Diplomate of both the American Board of Veterinary Practitioners (Food Animal Practice) and the American College of Veterinary Surgeons (Large Animal Surgery).

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**Mustajab Mirza, DVM, MS, DACVS, Associate Professor of Equine Surgery, Veterinary Clinical Sciences**

Dr. Mirza received his DVM from the College of Veterinary Sciences Lahore affiliated with the University of Agriculture (Pakistan) in 1992. He completed his surgery residency and received his MS degree from LSU Vet Med in 1998. Dr. Mirza is board certified in the American College of Veterinary Surgery. Dr. Mirza’s primary clinical interests include repair of long bone fractures and pathogenesis

of colics in equids, laminitis, ophthalmology, and advanced wound healing. He primarily provides after-hours emergency equine services for the LSU Veterinary Teaching Hospital. Dr. Mirza’s research interests are in long bone fractures, performance limitations, advanced therapeutics for osteoarthritis, and gastrointestinal disease in horses.

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**Colin F. Mitchell, BVMS, MS, DACVS, Large Animal Hospital Director and Professor of Equine Surgery, Veterinary Clinical Sciences**

Originally from Perth, Scotland, Dr. Mitchell received his veterinary medical degree from the University of Edinburgh and completed an internship at the University of Prince Edward Island prior to entering a combined three-year equine surgery residency and MS graduate program at the University of Minnesota, which he completed in 2004. He then remained on the hospital staff at the University of Minnesota, where he worked as the equine emergency clinician/surgeon until 2005, when he joined the faculty at LSU Vet Med. He is a Diplomate of the American College of Veterinary Surgeons, and his clinical interests include orthopedic, laparoscopic and respiratory surgery. His research interests include orthopedic implants and laminitis and pharmaceutical treatment of navicular disease.

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**Carlos Pinto**, DVM, Ph.D., DACT, Professor of Theriogenology, Veterinary Clinical Sciences

Dr. Pinto received his DVM from Sao Paulo State University (Brazil) in 1986 and his Ph.D. from the LSU School of Veterinary Medicine in 2001. He is a Diplomate of the American College of Theriogenologists. Dr. Pinto's clinical interests are in comparative theriogenology and assisted reproduction in equine, bovine, and canine species. He joined the faculty in 2013 and his primary research interests include mare reproductive endocrinology and assisted reproduction.

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**Cherie Pucheu-Haston**, DVM (LSU 1992), Ph.D., DACVD, Associate Dean for Clinical Programs and Professor of Dermatology, Veterinary Clinical Sciences

Dr. Pucheu-Haston received her DVM in 1992 from LSU Vet Med and completed an internship in small animal medicine and surgery at LSU in 1993. She received her residency training in veterinary dermatology at North Carolina State University and is a Diplomate of the American College of Veterinary Dermatology. She worked as a specialist in private practice for seven years, then returned to NCSU in 2002 to pursue advanced graduate training. She received her Ph.D. in immunology (with a minor in biotechnology) from NCSU in 2006. She completed three years as a post-doctoral research associate in the Immunotoxicology Branch of the U.S. Environmental Protection Agency, as a grantee

from the University of North Carolina-Chapel Hill. Dr. Pucheu-Haston returned to LSU as a faculty member in 2011. Her clinical and research interests are in cutaneous and respiratory allergic diseases in cats, dogs, and horses, and in the immunologic response to cutaneous fungal infections.

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**Patricia Queiroz-Williams**, DVM, MS, Professor of Veterinary Anesthesiology, Veterinary Clinical Sciences

Dr. Queiroz-Williams joined the faculty of LSU Vet Med in 2007. She received her DVM from the Universidade Federal de Minas Gerais (Brazil) in 1996 and her MS from the Universidade Estadual Paulista School of Medicine (Brazil) in 2002. She also completed a residency and her MS in anesthesiology at the Universidade Estadual Paulista (Brazil). Her research interests include inhalational MAC studies; Pulse Pressure Variation and Stroke Volume Variation monitoring in colic horses; pain management and its assessment in different species; anesthetic drugs' pharmacodynamic/pharmacokinetic.

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**Nathalie Rademacher**, Med. Vet., DACVR, DECVDI, Professor of Diagnostic Imaging, Veterinary Clinical Sciences

Dr. Rademacher received her Med.Vet. from the Justus-Liebig-University (Germany) in 2000 and her Dr.med.vet. from the University of Berne (Switzerland) in 2003. After completion of a small animal internship in a private referral center

in Switzerland, she completed a diagnostic imaging residency in 2006 at the Vetsuisse Faculty (Switzerland). Dr. Rademacher is a Diplomate of both the European College of Veterinary Diagnostic Imaging and the American College of Veterinary Radiology. She joined the faculty of LSU Vet Med in 2007. Her research focus is ultrasound in small and large animals, contrast enhanced ultrasound of the pancreas in dogs and cats, elastographic ultrasound application and lung ultrasound in dogs.

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**Laura Riggs**, DVM, Ph.D., DACVS, Associate Professor of Equine Surgery, Veterinary Clinical Sciences

Dr. Riggs is originally from Memphis, Tenn., and received her DVM from the University of Tennessee College of Veterinary Medicine in 2001. She completed a large animal internship followed by a large animal surgery residency at the University of Georgia. In 2007 she received her Ph.D. in veterinary physiology from the University of Georgia with research studying biomarkers in equine laminitis. Dr. Riggs is a Diplomate of the American College of Veterinary Surgeons. Her research focuses on lameness, laminitis, and fracture repair biomechanics.

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**Clare Scully**, MA, DVM, MS, Associate Professor of Food Animal Health Maintenance, Veterinary Clinical Sciences

Dr. Scully received her DVM from the University of Tennessee in 2011 and received her MS from Oregon

## Faculty

State University in 2015. She is board certified in the American College of Theriogenology. Her clinical interests include advanced reproduction techniques in ruminants, pain management in food animals, as well as food animal surgery. In 2013 Dr. Scully won the Western Veterinary Conference Food Animal Incentive Award and was awarded the Society of Theriogenology Emerging Leader Scholarship in 2014. Dr. Scully joined the faculty in 2015.

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**Jennifer Sones, DVM (LSU 2008), Ph.D., DACT,** Associate Professor of Theriogenology, Veterinary Clinical Sciences

Dr. Sones received her BS from LSU in 2004 and her DVM from LSU Vet Med in 2008. She received her Ph.D. from Cornell University in 2014 in molecular and integrative physiology. She completed her theriogenology residency at Cornell and is board certified in the American College of Theriogenology. Dr. Sones joined the faculty in 2015. Her research interests include comparative pregnancy physiology, preeclampsia and fetal growth restriction, and equine placentitis.

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**Matt Welborn, DVM, MPH, ACVPM,** Professor of Food Animal Health Management, Veterinary Clinical Sciences

Dr. Welborn received his DVM from the LSU School of Veterinary Medicine in 1987 and his MPH from the University of Tennessee in 2005. He is a Diplomate of the American College of Veterinary Preventive Medicine, and his specialty is in farm animal production medicine. His research and clinical interests are in veterinary public health, agroterrorism, emergency preparedness, and toxic plants. Dr. Welborn joined the faculty in 2012.



*From left, Dr. Charles McCauley, Dr. Chi-Chin Liu, Dr. Antonieta Guerrero-Plata, Dr. Carlos Aguilar, Dr. Laura Riggs, and Dr. Britta Leise.*



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## **Former Graduate Students**

### **Carlos Aguilar, DVM**

Dr. Aguilar, from Obregon, Mexico, received his MS degree in May 2020 from the Veterinary Clinical Sciences. His thesis was entitled “In Vitro Analysis of Equine Platelet Rich Plasma and In Vivo Effect of Cytokines after Repeated Intra-Articular Injections in Osteoarthritic Joints,” and his major advisor was Associate Professor Laura Riggs, DVM, Ph.D., DACVS. In July, Dr. Aguilar began a combined large animal surgery residency/Ph.D. program at the LSU Vet Med.

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### **Gabriel Castro, DVM**

Dr. Castro-Cuellar is originally from Colombia. He received his DVM degree from La Salle University in Bogota, Colombia in April 2015. Currently he is a resident in Veterinary Anesthesia and Analgesia and a MS student in the department of Veterinary Clinical Sciences (VCS) at LSU. He is expected to complete his thesis in March 2022. Dr. Castro-Cuellar’s thesis is entitled, “The chondrotoxicity, pharmacokinetics and pharmacodynamics of intra-articular buprenorphine in horses”. His mentor is Dr. Jeannette Cremer, assistant professor in Veterinary Anesthesia and Analgesia in the VCS department at LSU.

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### **Jonuel Cruz-Sanabria, DVM (LSU 2015)**

Dr. Cruz-Sanabria BS, DVM, received his Bachelor in Science from the University of Puerto Rico 2008. He graduated with a his Doctor of Veterinary Medicine degree from Louisiana State University in 2015. Following graduation, he completed an equine internship at Weatherford Equine Medical Center and a large animal surgery and medicine internship at the LSU School of Veterinary Medicine. From 2017-2018 he served as a research fellow in the Equine Health Studies Program. In 2021, Dr. Cruz received his Master’s degree from LSU Vet Med. His thesis was entitled “Development of an Ultrasound-Guided Perineural Injection Technique of the Caudal Cervical Spinal Nerve Roots in horses” and his major advisor was Dr. Britta Leise. Dr. Cruz is currently is an assistant professor of equine surgery at LSU Vet Med.

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### **Luis Henrique de Aguiar, DVM, Ph.D., DACT**

Dr. Aguiar received his DVM degree in 2011 and his Ph.D. in Biotechnology in 2017 from Santa Catarina State University (Brazil). He will be completing his residency in Theriogenology in the summer of 2021 and became a Diplomate of the American College of Theriogenologists in 2020. His clinical interests are in comparative Theriogenology and the use of assisted reproductive technologies in multiple species. He is currently pursuing a Masters degree in the

Department of Veterinary Clinical Sciences, studying strategies to develop conventional equine in vitro fertilization. Dr. Aguiar major professor is Dr. Carlos Pinto.

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### **Bryce Gilbert, BS**

Gilbert’s Master’s thesis was entitled “Localization of kisspeptin and kisspeptin receptor in the equine ovary.” His major professor is Dr. Erin Oberhaus, assistant professor in the Department of Animal Sciences, College of Agriculture, LSU.

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### **Viviane Gomes, DVM, DACT**

Dr. Gomes, originally from Brazil, is a theriogenology resident and Ph.D. student at LSU Vet Med. She received her DVM from the Universidade Federal de Minas Gerais (Brazil) in 2014, after completing an exchange program at Kansas State University. Dr. Gomes worked as a veterinary technician and volunteer researcher at Rood and Riddle Equine Hospital (Kentucky) and completed an internship in Large Animal Field Services and Theriogenology at the University of Georgia. She worked as an equine practitioner and CEO of a veterinary clinical pathology laboratory in Brazil for two years before coming to LSU to pursue advanced training. Dr. Gomes is a Diplomate of the American College of Theriogenologists. Her clinical interests are comparative theriogenology and assisted reproduction in equine and canine species. Her research focuses on placentation and maternal-fetal interactions during pregnancy, using

## Graduate Program

the horse and mouse as model species. Dr. Gomes's dissertation is entitled "The role of kisspeptins in Trophoblast Cell Dynamics", having Dr. Jenny Sones as her research mentor. Dr. Gomes expects to complete her doctoral studies in 2022.

### Lawrence Kadic, MVetMed

Dr. Kadic graduated from the University of Ghent, Belgium in 2016. After graduation he went on and completed a one-year equine rotational internship at the Dubai Equine Hospital in the UAE. Having the goal of becoming an equine surgeon, he completed two more years as a surgery intern at Hagyard Equine Medical Institute in Kentucky and as a Large Animal Clinical Fellow at the Oregon State University in Corvallis. In 2019, Dr. Kadic started his 3-year Equine Surgery Residency at LSU. He is currently in his second year of his residency and is enrolled in a Master's program in Veterinary Clinical Sciences. His research is focused on the biomechanics of different type of constructs for metacarpo/metatarso-phalangeal arthrodesis in horses. His mentor and research advisor is Dr. Laura Riggs. He is due to complete this research in the spring of 2022.

### Chun Kuen "Eric" Mak

Mak is a Ph.D. candidate and theriogenology resident at LSU Vet Med. Mak's advisor is Dr. Carlos Pinto, professor of theriogenology. He received his DVM from National Taiwan University in 2017. His career goal is to become academic clinician-scientist specializing in comparative theriogenology.

## Current Graduate Students

### Rita Aoun, MS

Rita Aoun received her BS degree in electrical engineering from Lebanese University in 2017 and her Master's degree in biomedical engineering from the University of Nevada in Reno. She developed her interest in the physics of the body through her research experience with pharmacologist, neurobiologist and biomedical engineers. She is currently a member of LECOR and is working towards her Ph.D. with Dr. Lopez as her major professor. Her area of study focuses on the biomechanical testing and 3D modeling of the equine foot in loading and unloading conditions.

### Kalie Beckers, MS

Kalie Beckers is from Independence, Louisiana. She received her BS and MS degrees from Southeastern Louisiana University. Kalie is enrolled in the dual DVM/Ph.D. program and has completed the first 3 years of her veterinary curriculum and is currently working on her Ph.D. research. Her major professor is Dr. Jenny Sones and her thesis title is "The contribution of the maternal microbiome on reproductive function during pregnancy and disease. In addition to her research interest Kalie is an accomplished equestrian that competes nationally in 3-day eventing and has just completed veterinary acupuncture training from the Chi Institute in 2020.

### Linda Paul, DVM

Dr. Paul is from Lake Jackson, TX and received her DVM degree from Cornell University in 2017. She completed a one-year, rotating equine internship at LSU and is currently the Equine Internal Medicine resident at the LSU Veterinary Teaching Hospital. Additionally, she is a Ph.D. student within the Veterinary Clinical Sciences Department under Dr. Heidi Banse. The focus of Dr. Paul's research is on equine glandular gastric disease (EGGD) to contribute to the understanding of this disease's pathophysiology. Current investigations are underway into the potential role of the gastric microbiome on the development and persistence of this disease.



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## Takashi Taguchi, DVM

Dr. Taguchi is from Sapporo Japan. He received his BS and DVM from Osaka Prefecture University in Osaka, Japan. He also has a Master's degree from Western University of Health Sciences. Dr. Taguchi completed his Ph.D. under the guidance of Dr. Mandi Lopez. His thesis research involves novel, natural, and regenerative therapies for degenerative diseases in animals.

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## Society of Phi Zeta

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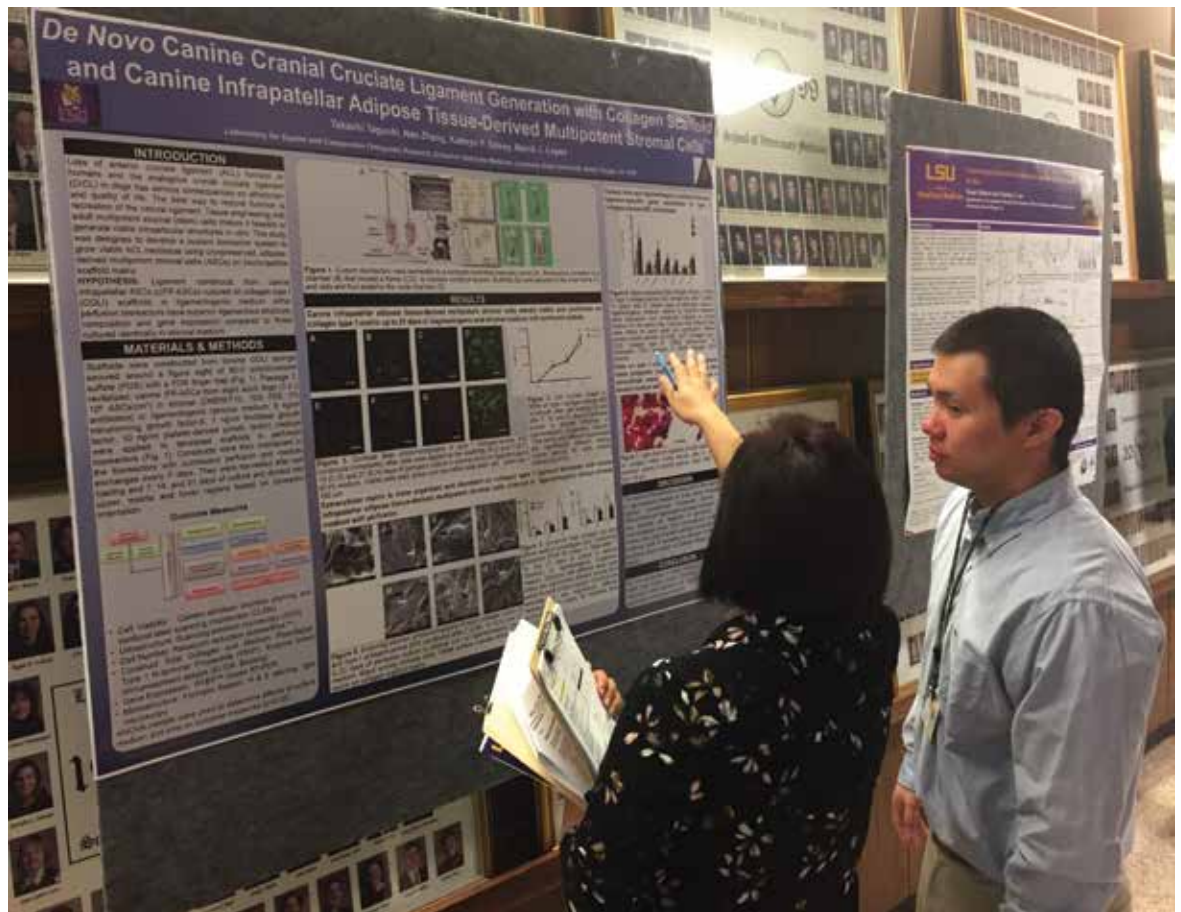
Phi Zeta Research Emphasis Day—a day established to promote research in schools of veterinary medicine, to recognize research conducted by veterinary students, House Officers (residents and interns), graduate students, post-doctoral fellows, and faculty, and to encourage veterinary students to pursue careers in research.

Phi Zeta is the national veterinary honor society, which recognizes and furthers

scholarship and research in matters pertaining to the welfare and diseases of animals. The importance of this day to LSU Vet Med is underlined by the fact that the Veterinary Teaching Hospital is closed except for emergencies to allow all students and House Officers to participate.

*Dr. Takashi Taguchi answering questions about his research poster at Phi Zeta Research Emphasis Day in 2023.*

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## Publications

Go, Yun Young, Hazard, N.W., Balasuriya, U.B.R., Chapman, A.M., Fitton, N.S., Kenez, A., Andrews, F.M. (2022) Clinical Evaluation of the Immulite® 1000 Chemiluminescent Immunoassay for Measurement of Equine Serum Insulin. *Frontiers Veterinary Science* (Submitted and in review).

Paul, L., Ericsson, A.C., Andrews, F.M., McAdams, Z., Keowen, M.L., St. Blanc, M.P., Banse, H.E. (2022). *J. Am. Vet. Med. Assoc.* (early view, in press). DOI: <https://avmajournals.avma.org/view/journals/javma/aop/javma.22.07.0277/javma.22.07.0277.xml>

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Camacho-Luna, P., Andrews, F.M., Keowen, M.L., Garza, Jr., F., Liu, C-C., Lamp, B., Olijve, J. (2022) The Effect of Porcine Hydrolyzed Collagen on the Gastric Ulcer Scores, Gastric Juice pH, Gastrin and Amino Acid Concentrations in Horses. *Equine Vet. Educ.* 34(5), 248-257. <https://doi.org/10.1111/eve.13409>

St. Blanc, M., Banse, H., Retif, M., Arana-Valencia, N., Keowen, M.L., Garza, Jr., F., Liu, Chin-Chi, Gray, L. F., Andrews, F. M. (2022) Effects of supplements containing Turmeric and Devil's Claw on equine gastric ulcer scores and gastric juice pH. *Equine vet. Educ.* 34(5), 241-247 <https://doi.org/10.1111/eve.13404>

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- Recognized as one of Wiley's most cited journal articles 2020-2021 in subject area
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## Refereed Articles

Bailey, V.,N., Sones, J.L., Camp, C.M., Gomes, V.C.L., Oberhaus, E.L. (2022) Endocrine and ovarian responses to combined estradiol benzoate-sulpiride in seasonally anovulatory mares treated with kisspeptin. *Ani. Reprod. Sci.*, 247:107087 doi: 10.1016/j.anireprosci.2022.107087

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## Non-refereed Articles

Beckers, K.F. & Sones, J.L. (2022) Colic in the pregnant and postpartum mare (Spring Edition), *The Remuda*, by the Texas Equine Medical Association.

Sones, J.L. (2020). *Managing Placentitis: A Leading Cause of Reproductive Loss* (11th ed., vol. 10). *The Modern Equine Vet.*

## Scientific Abstracts

St. Blanc MP, Chapman AM, Keowen ML, Garza, Jr., F, Gray L, Andrews FM. Effect of a supplement containing cannabidiol (CBD) on sedation and ataxia scores and health parameter. American College of Veterinary Internal Medicine Forum, Austin, TX; June 2022.

Andrews FM, St. Blanc, MP, Retif M, Arana-Valencia N, Keowen, ML, Garza, Jr., F, Gray, L, Liu, C-C. Effect of a supplement containing turmeric and devil's claw on equine gastric ulcer scores. American College of Veterinary Internal Medicine Forum, Virtual, June 2021.

St. Blanc MP, Chapman AM, Keowen ML, Garza Jr., F, Gray L, Andrews FM. Effect of a supplement containing cannabidiol (CBD) on sedation and ataxia scores and health parameter. American Association of Equine Practitioners Annual Meeting, Nashville, TN. December 2021.

Andrews FM (2021) Effect of an oral supplement containing curcumin extract (Longvida™) on gastric ulcers scores. Colic Research Symposium, September 4-7, 2021. Poster Presentation, Virtual.

St. Blanc, M., Keowen, M.L., Garza, Jr., F., Andrews, F.M. (2021) Clinical efficacy of fourteen day omeprazole treatment for equine gastric ulcer syndrome: A controlled retrospective study. Colic Research Symposium, September 4-7, 2021. Poster Presentation, Virtual.

Camacho-Luna, P., Andrews, F.M., Gaschen L., Markle, M., Keowen, M.L., Garza, Jr., F., Kearney, M., Storey, E. Effects of frequently administration of ophthalmic atropine sulfate solution on the GI motility and transit time in horses. Colic Research Symposium, September 4-7, 2021. Poster Presentation, Virtual.

Andrews, F.M., St. Blanc, M., Banse, H., Retif, M., Arana-Valencia, N., Keowen M.L., Garza, Jr., F., Gray, L., Liu, C-C. (2021) Effects of supplements containing Turmeric and Devil's Claw on equine gastric ulcer scores and gastric juice pH. Colic Research Symposium, September 4-7, 2021. Oral Presentation, Virtual, by Dr. Michael St. Blanc.

Patton, M., Leise, B.S., Baker, R.E., Andrews F.M. (2021) The effects of bit chewing on borborygmi, duodenal motility, and gastrointestinal transit time in clinically normal horses. Colic Research Symposium, September 4-7, 2021. Oral Presentation, Virtual, by Dr. Molly Patton.

Beckers, K.F., Gomes, V.C.L., Schultz, C., Childers, G., Sones, J.L. Metagenetic analysis of the pregnant microbiome in horses. Society For Theriogenology, Seattle, WA; July, 2022. (podium)

## Publications, Abstracts & Proceedings

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Herzog, F., Beckers, K.F., Heil, B.A., Thompson, S.K., Kearns, T.A., Murrell, J., King, G., Sones, J.L. The Seminal Microbiome and Reproductive Outcomes of Thoroughbred Stallions in Louisiana, US. Society For Theriogenology, Seattle, WA; July, 2022. (podium)

Geels, O., Gomes, V.C.L., Liu, C.C., Oberhaus, E., Sones, J.L. Analyzing the Effects of Kisspeptin-10 on In Vitro Models of Equine Placental Development. LSU School of Veterinary Medicine Phi Zeta Research Emphasis Day, virtual, Feb, 2021.

Gomes, V.C.L., Crissman, K.R., Bailey, V., Camp, C., Liu, C.C., Magee, C., Sones, J.L. The effects of Kisspeptin-10 in the migration of equine chorionic girdle trophoblast cell. Society For Theriogenology, Omaha, NE; July, 2021. (podium)

Miley, K., King, G., Sones, J.L. A Metagenetic Comparison of the Normal and Problem Estrual Mare: A Clinical Study. LSU School of Veterinary Medicine Phi Zeta Research Emphasis Day, Baton Rouge, LA; Feb, 2020. (poster).

Balasuriya, U. B. R and Carossino, M. Genomic and Transcriptomic Signatures Associated with Equine Arteritis Virus Persistent Infection in the Stallion. XV International Nidovirus Symposium, Egmond aan Zee, The Netherlands, May 10-14, 2020.

Carossino, M. and Balasuriya, U. B. R. Role of MicroRNA eca-mir-128, CXCL16 and other C-X-C Motif Chemokines and Receptors During Equine Arteritis Virus (Alphaarterivirus equid) Persistent Infection. XV International Nidovirus Symposium, Egmond aan Zee, The Netherlands, May 10-14, 2020.

Ellerbrock, R., Canisso, I., Carossino, M., Balasuriya, U. B. R. 2020. Expression of prostaglandin E2 and oxytocin receptors in the stallion accessory sex glands. 2nd Symposium of the European College of Animal Reproduction, University of Veterinary Medicine, Budapest, Hungary. August 6-8, 2020.

Ellerbrock, R., Canisso, I., Carossino, M., Balasuriya, U. B. R. 2020 . Expression of prostaglandin E2 and oxytocin receptors in the stallion accessory sex glands. Therio Conference. Society for Theriogenology. Pittsburgh, PA. July 22-25, 2020.

Carossino, M. and Balasuriya, U. B. R. 2021. Role of MicroRNA eca-mir-128, CXCL16 and other C-X-C Motif Chemokines and Receptors During Equine Arteritis Virus (Alphaarterivirus equid) Persistent Infection. XV International Nidovirus Symposium, June 7-8, 2021.

Balasuriya, U. B. R. and Carossino, M. Genomic and Transcriptomic Signatures Associated with Equine Arteritis Virus Persistent Infection in the Stallion. XV International Nidovirus Symposium, June 7-8, 2021.

Sarkar, S., Carossino, M. and Balasuriya, U. B. R. 2021. Vimentin as a cellular protein involved in equine arteritis virus attachment and entry. Conference of Research Workers in Animal Diseases 2021, Chicago, IL, December 3-7, 2021.

Balasuriya, U. B. R. 2022. Inaugural Bernard and Gloria Salick Lecture, Center for Equine Health, School of Veterinary Medicine, University of California, Davis, CA. August 08, 2022 (Invited Presentation)

Balasuriya, U. B. R. 2022. Equid Herpesvirus Myeloencephalopathy (EHM) / EHV-1 Diagnostic Testing. 4th Annual International Veterinary Diagnostic Conference (AVDC via Zoom), China August 28th – 30th 2022 (Invited Presentation)

Barros C., Loynachan A., Goehring L., MacGillivray K., Bozorgmanesh R., Carossino M., Balasuriya U. B. R., and Slovis N. 2022. Myenteric Ganglionitis Underlying Intestinal Motor Dysfunction in 3 Horses Diagnosed with EHV-1 postmortem. American Association of Veterinary Laboratory Diagnosticians, Minneapolis, MN. October 6-12, 2022

Thieulent CJ, Carossino M, Balasuriya UBR, Graves K, Bailey E, Eberth J, Andrews FM, Keowen, M, and Go, YY. 2022. Development of a TaqMan® allelic discrimination PCR assay for rapid detection of equine CXCL16 allelic variants associated with the establishment of long-term equine arteritis virus carrier state in stallions. American Association of Veterinary Laboratory Diagnosticians, Minneapolis, MN. October 6-12, 2022.

Paul L, Ericsson A, Andrews F, Keowen M, St Blanc M, Banse H. Pilot field study comparing the microbiome in horses with and without equine glandular gastric disease. 13th International Colic Symposium; virtual, July, 2021 (virtual). Poster.

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Paul L, Ericsson A, Andrews F, Keowen M, St Blanc M, Banse, H. Comparison of the gastric microbiome in horses with and without equine glandular gastric disease: preliminary analysis of a field study. ACVIM Forum, Baltimore, MD; June 2020. Poster.



- Banse H, Chapman A, Hazard N, Fletcher J. ACTH stability in frozen equine plasma. 4th Global Equine Endocrine Symposium, Gut Ising, Germany; January, 2020. Podium.
- Banse H, Whitehead A, McFarlane D, Chelikani P. Comparison of skeletal muscle mass and skeletal muscle proteolysis in horses with and without PPID. 4th Global Equine Endocrine Symposium, Gut Ising, Germany; January, 2020. Podium.
- Aoun R, Takawira C, Lopez MJ. Shoe Configuration Effects on the Hoof Deformation and P3 motion: A Biomechanical Investigation in Unaffected Versus Laminitic Equine Hooves. American College of Veterinary Surgery Summit, Portland, OR, Oct. 13-15, 2022.
- Taguchi T, Takawira C, Aoun R, Lopez MJ. Tendon Neotissue from Equine Adult Adipose Derived Multipotent Stromal Cells Augments Healing of Rat Calcaneal Tendon Elongation Injuries. American College of Veterinary Surgery Summit, Portland, OR, Oct. 13-15, 2022.
- Lopez MJ, Takawira C, Mitchell S. Weekly Non-steroidal Anti-inflammatory Drug Dosing Improves Hind Limb Use in Dogs with Coxofemoral Joint Osteoarthritis. American College of Veterinary Surgery Summit, Portland, OR, Oct. 13-15, 2022.
- Taguchi T, Lopez MJ. De novo tendon neotissue from equine adult stem cells. Orthopaedic Research Society Meeting, Tampa, FL, Feb. 4-8, 2022.
- Lopez MJ, Takawira C, Mitchell S. Weekly nonsteroidal anti-inflammatory drug dosing improves hind limb use in dogs with coxofemoral joint osteoarthritis. Orthopaedic Research Society Meeting, Tampa, FL, Feb. 4-8, 2022.
- Taguchi T, Lopez MJ. De novo tendon neotissue from equine adult stem cells. American College of Veterinary Surgery Summit, Virtual, Oct. 7-9, 2021.
- Lopez MJ, Wang P, Takawira C, Liu C. Medical professional wrist motion varies between digital versus manual device use. American College of Veterinary Surgery Summit, Virtual, Oct. 7-9, 2021.
- Aoun R, Wang P, Takawira C, Osborn M, Lopez MJ. Shoe configuration effects on the third phalanx motion: in situ study in unaffected versus laminitic equine hooves. American College of Veterinary Surgery Summit, Virtual, Oct. 7-9, 2021.
- Taguchi T, Takawira C, Morales-Yniguez F, Wang P, Gilad G, Andrews F, Lopez MJ. Therapeutic effects of oral agmatine for equine lameness and gastric ulceration. Orthopaedic Research Society Meeting, Virtual, Feb. 12-16, 2021.
- Takawira C, Spivey KP, Taguchi T, Osborn ML, Lopez MJ. Canine coxofemoral joint extension increases radiographic joint volume compared to joint flexion. Orthopaedic Research Society Meeting, Virtual, Feb. 12-16, 2021.
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- Taguchi T, Takawira C, Morales-Yniguez F, Keowen M, Yang Q, Halpen E, Gilad G, Andrews F, Lopez MJ. Therapeutic effects of oral agmatine for equine lameness and gastric ulceration. American College of Veterinary Surgeons Surgery Summit, Virtual, Oct. 21-24, 2020.
- Xiao N, Lopez MJ. Cryopreservation and cell sorting affect feline ASC in vitro behavior. American College of Veterinary Surgeons Surgery Summit, Virtual, Oct. 21-24, 2020.
- Takawira C, Lopez MJ. Hip extended radiographs alter joint volume. American College of Veterinary Surgeons Surgery Summit, Virtual, Oct. 21-24, 2020.
- Wang P, Takawira C, Taguchi T, Niu X, Nazzal M, Lopez MJ. Equine shoe modifications to enhance traction alter gait kinetics at a trot in non-lame horses. American College of Veterinary Surgeons Surgery Summit, Virtual, Oct. 21-24, 2020.
- Yang Q, Lopez MJ. Interleukin effects on hoof progenitor cells. American College of Veterinary Surgeons Surgery Summit, Virtual, Oct. 21-24, 2020.
- Takawira C, Bova J, Bhumiratana S, Munding G, Dietrich MA, Vunjak-Novakovic G, Lopez MJ. Adipose-derived multipotent stromal cells reduce systemic response to xenograft. Orthopaedic Research Society Meeting, Phoenix, AZ, Feb. 8-11, 2020.
- Yang Q, Lopez MJ. Equine hoof progenitor cells: a model for altered tissue healing from epithelial to mesenchymal transition. Orthopaedic Research Society Meeting, Phoenix, AZ, Feb. 8-11, 2020.
- Wang P, Fox MP, Takawira C, Liu CC, Boatwright E, Lucak T, Fugarino B, Lopez MJ. Wrist motion varies between activities using digital versus manual devices. Orthopaedic Research Society Meeting, Phoenix, AZ, Feb. 8-11, 2020.
- Castro-Cuellar G, Cremer J, Queiroz-Williams P, C-C Liu, Leise B. Pharmacodynamic and analgesic effects of intra-articular buprenorphine in horses with lipopolysaccharide-induced synovitis. International Veterinary Emergency and Critical Care Symposium, Nashville, TN, September 2021

Castro-Cuellar G, Cremer J, Queiroz-Williams P, Hampton C, Leise B. Toxicity assessment of buprenorphine on equine articular chondrocytes in vitro. International Veterinary Emergency and Critical Care Symposium, Virtual Platform, September 2020

Alling CR, Cremer J, CC Liu, Lewin AC, Camacho-Luna MP, Carter RT. Effect of multiple head positions on intraocular pressure in healthy anesthetized horses during hoisting. ACVO meeting, Boston, September 2020.

Joyner RL, CC Liu, Cremer J, Carter RT, Lewin AC. Comparison of intraocular pressure reduction following administration of four intravenous sedation protocols in normal horses. ACVO meeting, Boston, September 2020.

Redmond JS, Stang BV, Schlipf Jr JW, Christensen JM. (2022) Pharmacokinetics of diphenhydramine following single-dose intravenous and oral administration in non-fasted adult horses. International Veterinary Emergency and Critical Care Symposium, Nashville, TN; September 2021.

Lomnicka I, Dubey S, Waller P, Dirikolu L. Development and Validation of General Plasma and Urine Screening Procedures in Racehorses utilizing ExtraHera and LC-MS-MS Systems. LSU School of Veterinary Medicine Phi Zeta Research Day, Baton Rouge, LA; February 2022.

Balasuriya, U. B. R and Carossino, M. Genomic and Transcriptomic Signatures Associated with Equine Arteritis Virus Persistent Infection in the Stallion. XV International Nidovirus Symposium, Egmond aan Zee, The Netherlands, May 10-14, 2020.

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Persistent Infection. XV International Nidovirus Symposium, June 7-8, 2021.

Balasuriya, U. B. R. and Carossino, M. Genomic and Transcriptomic Signatures Associated with Equine Arteritis Virus Persistent Infection in the Stallion. XV International Nidovirus Symposium, June 7-8, 2021.

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Barros C., Loynachan A., Goehring L., MacGillivray K., Bozorgmanesh R., Carossino M., Balasuriya U. B. R., and Slovis N. 2022. Myenteric Ganglionitis Underlying Intestinal Motor Dysfunction in 3 Horses Diagnosed with EHV-1 postmortem. American Association of Veterinary Laboratory Diagnosticians, Minneapolis, MN. October 6-12, 2022.

Thieulent CJ, Carossino M, Balasuriya UBR, Graves K, Bailey E, Eberth J, Andrews FM, Keowen, M, and Go, YY. 2022. Development of a TaqMan® allelic discrimination PCR assay for rapid detection of equine CXCL16 allelic variants associated with the establishment of long-term equine arteritis virus carrier state in stallions. American Association of Veterinary Laboratory Diagnosticians, Minneapolis, MN. October 6-12, 2022.

## Book Chapters

Brinton MA, Balasuriya UBR, Dunowska M, Faaberg KS, Goldberg T, Leung FC, Nauwynck HJ, Snijder EJ, Stadejek T, Gorbalenya AE, and Gulyaeva A. (2022). Family Arteriviridae. International Committee on Virus Taxonomy (ICTV) Report.

Balasuriya UBR, Carossino M, and Go YY, (2022) Arteriviridae and Roniviridae (Chapter 63). In: Veterinary Microbiology (Fourth Edition), Edited by D. S. McVey, M. M. Chengappa and M. Kennedy. Blackwell Publishing, Ames, IA.

Fang, Y, Snijder EJ, and Balasuriya UBR. (2022) Arteriviruses (Chapter 29). In Fields Virology (Seventh Edition), Edited by

David M. Knipe and Peter M. Howley. Wolters Kluwer / Lippincott Williams & Wilkins, Philadelphia, PA.

Brinton MA, Balasuriya UBR, Dunowska M, Faaberg KS, Goldberg T, Leung FC, Nauwynck HJ, Snijder EJ, Stadejek T, Gorbalenya AE, and Gulyaeva A. (2022). Family Arteriviridae. International Committee on Virus Taxonomy (ICTV) Report.

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## CE Presentations

Andrews, F.M. (2022) Ulcer update in horses. Mississippi VMA Summer Meeting, Gulf Shores, AL, July 15, 2022.

Andrews, F.M. (2022) Abdominal Ultrasound in Equine Practice. Mississippi VMA Summer Meeting, Gulf Shores, AL, July 15, 2022.

Andrews, F.M. (2022) Case Discussions. Mississippi VMA Summer Meeting, Gulf Shores, AL, July 15, 2022.

Andrews, F.M. (2022) The Science of Supplements (Part 1). Louisiana Veterinary Medical Association (LVMA), Winter Meeting, January 29, 2022.

Andrews, F.M. (2022) The Science of Supplements (Part 2). Louisiana Veterinary Medical Association (LVMA) Winter Meeting, January 29, 2022.

Andrews, F.M. (2021) How to diagnose and manage gastric ulcers as a medical reason for poor performance. Presented at the American Association of Equine Practitioners (AAEP), December 6, 2021.

Andrews, F.M. (2021) Update on Gastric Ulcer Disease (EGUS): Diagnosis and Treatment. Presented at the Annual meeting Illinois State VMA (ISVMA), Virtual, November 13, 2021.

Andrews, F.M. (2021) Colic: When Should I Refer? Presented at the Annual meeting of the Illinois State VMA (ISVMA), November 13, 2012.

Andrews, F.M. (2021) Update on Equine Metabolic Syndrome: Diagnosis and Treatment. Presented at the Annual Illinois State VMA (ISVMA), Virtual, November, 13, 2021.

Andrews, F.M. (2021) The Science of Equine Supplements. Southwest Veterinary Symposium. San Antonio, TX. September 24, 2021.

Andrews, F.M. (2021) The Science of Equine Supplements (Part 2). Southwest Veterinary Symposium. San Antonio, TX, September 24, 2021.

Andrews, F.M. (2021) Effect of an oral supplement containing curcumin extract (Longvida™) on gastric ulcers scores. Colic Research Symposium, September 4-7, 2021.

Sones, J.L. & Beckers, K.F. 2021 Bluegrass Symposium. "Equine reproductive tract microbiome" Lexington, KY, October 2021 (1 hour)

Sones, J.L. Review of Infectious Causes of Abortion in the Equine Patient. American Veterinary Medical Association Meeting, virtual; July 2021

Sones, J.L. Problems of Equine Pregnancy. Louisiana Veterinary Medical Association Winter Meeting, Baton Rouge, LA; April 2021

Sones, J.L. Ascending Bacterial Placentitis in the Mare. Louisiana Veterinary Medical Association Winter Meeting, Baton Rouge, LA; April 2021

Sones, J.L. Common Postpartum Complications in the Mare. American Veterinary Medical Association Meeting, virtual; July 2020

Sones, J.L. Equine Placentitis. American Veterinary Medical Association Meeting, virtual; July 2020

Sones, J.L. Common Problems of Pregnancy in the Mare. American Veterinary Medical Association Meeting, virtual; July 2020

Mitchell C. Kissing Spines: How to evaluate and treat them. Louisiana Veterinary Medical Association Winter Meeting. New Orleans. LA. January 2022

Mitchell C. Post Castration complications: How to evaluate and treat them. Louisiana Veterinary Medical Association Winter Meeting. New Orleans. LA. January 2022

## Publications, Abstracts & Proceedings

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Banse H. Diagnosing, managing, and feeding the PPID horse. American College of Veterinary Internal Medicine Forum. Austin, TX. June 2022.

Banse H. Aging Gracefully: How to manage the geriatric horse. CanWest Veterinary Conference. Virtual. October 2021.

Banse H. Pain or Inflammation? How to approach NSAID selection in horses. CanWest Veterinary Conference. Virtual. October 2021.

Banse H. Equine glandular gastric disease: Lesions or ulcers. CanWest Veterinary Conference. Virtual. October 2021.

Banse H. Approach to diagnosis of endocrinopathic laminitis. Southwest Veterinary Symposium. San Antonio, TX. September 2021.

Banse H. Approach to management of endocrinopathic laminitis. Southwest Veterinary Symposium. San Antonio, TX. September 2021.

Banse H. Antimicrobials in equine practice: how to choose which one to use. Southwest Veterinary Symposium. San Antonio, TX. September 2021.

Banse H. New insights into equine glandular gastric disease. Southwest Veterinary Symposium. San Antonio, TX. September 2021.

Banse H. NSAID selection in horses: a case-based approach. AVMA Convention. Virtual. July 2021.

NSAID-induced gastrointestinal disease: pathophysiology and treatment. ACVIM Forum. Virtual. June 2021.

Aging gracefully: Care of the geriatric horse. LVMA Winter Meeting, Baton Rouge, LA. April 2021.

The coughing horse: how to choose and interpret respiratory diagnostics. LVMA Winter Meeting, Baton Rouge, LA, April 2021.

Donkeys are not just long-eared horses. AVMA Convention. Virtual. August 2020.

Lopez M. New perspectives on canine cranial cruciate ligament rupture. Louisiana Veterinary Medical Association Winter Meeting, Baton Rouge, LA, April 30, 2021. (Podium)

Lopez M. The past, present and future of canine cranial cruciate ligament rupture. Louisiana Veterinary Medical Association Winter Meeting, Baton Rouge, LA, April 30, 2021. (Podium)

Redmond J. Differentiating and Treating Common Small Ruminant Neurologic Diseases. LVMA Winter Meeting. January 2022. (Podium)

Redmond J. Working Through Weight Loss Cases in Small Ruminants. LVMA Winter Meeting. January 2022. (Podium)

Redmond J. Why is My Goat Losing Weight, Doc? AVMA Convention; July 2022.

Redmond J. Recognizing, Diagnosing, and Treating Neurologic Disease in Small Ruminants. AVMA Convention; July 2022.

Redmond J. Partnering with Your Clients to Manage Intestinal Parasites in Small Ruminants. AVMA Convention; July 2022.

## Poster Presentation, Virtual

St. Blanc, M., Keowen, M.L., Garza, Jr., F., Andrews, F.M. (2021) Clinical efficacy of fourteen day omeprazole treatment for equine gastric ulcer syndrome: A controlled retrospective study. Colic Research Symposium, September 4-7, 2021. Poster Presentation, Virtual.

Camacho-Luna, P., Andrews, F.M., Gaschen L., Markle, M., Keowen, M.L., Garza, Jr., F., Kearney, M., Storey, E. Effects of frequently administration of ophthalmic atropine sulfate solution on the GI motility and transit time in horses. Colic Research Symposium, September 4-7, 2021. Poster Presentation, Virtual.

Andrews, F.M., St. Blanc, M., Banse, H., Retif, M., Arana-Valencia, N., Keowen M.L., Garza, Jr., F., Gray, L., Liu, C-C. (2021) Effects of supplements containing Turmeric and Devil's Claw on equine gastric ulcer scores and gastric juice pH. Colic Research Symposium, September 4-7, 2021. Oral Presentation, Virtual, by Dr. Michael St. Blanc.

Patton, M., Leise, B.S., Baker, R.E., Andrews F.M. (2021) The effects of bit chewing on borborygmi, duodenal motility, and gastrointestinal transit time in clinically normal horses. Colic Research Symposium, September 4-7, 2021. Oral Presentation, Virtual, by Dr. Molly Patton.

Andrews, F.M. (2021) Optimizing Gut Health: Colonic Acidosis. South Dakota Veterinary Medical Association Summer Conference, Sioux Falls, SD August 16, 2021.

Andrews, F.M. (2021) Right Dorsal Colitis. South Dakota Veterinary Medical Association Summer Conference, Sioux Falls, SD August 16, 2021.

Andrews, F.M. (2021) Equine Gastric Ulcer Syndrome: An update. South Dakota Veterinary Medical Association Summer Conference, Sioux Falls, SD August 16, 2021.

Buchanan B. and Andrews, F.M. Equine Gastric Ulcer Syndrome. 2020 American Association of Equine Practitioners Convention and Trade Show. Virtual Table Topics, December 3, 2020.

Andrews, F.M. (2020) Colic: Making Decisions, Referral and Prognosis. Mississippi Veterinary Medical Association Winter Conference, Starkville, MS. Feb. 28-29, 2020.

Andrews, F.M. (2020) Abdominal Ultrasound in horses with acute colic. Mississippi Veterinary Medical Association Winter Conference, Starkville, MS. Feb. 28-29, 2020.

Andrews, F.M. (2020) Equine Gastric Ulcer Syndrome. Mississippi Veterinary Medical Association Winter Conference, Starkville, MS. Feb. 28-29, 2020.

Andrews, F.M. (2020) Equine supplements: Science behind the label claims. Mississippi Veterinary Medical Association Winter Conference, Starkville, MS. Feb. 28-29, 2020.

Andrews, F.M. (2020) Pituitary Pars Intermedia Dysfunction: An Update. Mississippi Veterinary Medical Association Winter Conference, Starkville, MS. Feb. 28-29, 2020.

Benton Levith E, Hampton CE, Mitchell CF, Sun X, daCunha A, Quieroz-Williams P, Mitchell M. Correlation between sepsis scores and arterial blood pressures and their variability in anesthetized foals: 88 cases. Phi Zeta Research Day. Baton Rouge. LA. February 2022.



*Animal osteopath Anais Musso working with students on an equine patient.*

# Charles V. Cusimano EHSP Grants (Funded: 2021-2022)

## Shoe Configuration Effects on Equine Third Phalanx Motion: In-Situ Biomechanical Investigation in Unaffected Versus Laminitic Equine Hooves

### Authors/Investigators

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Mandi Lopez, DVM, MS, PhD

Catherine Takawira, MS

### Study Summary

The goal of this study is to assess the stabilizing effects of shoe configuration on P3 and hoof components. The information will be used to build an accessible digital format for veterinarians, farriers, and equine medical professionals. Taken together, the new information will facilitate identification of the optimal shoeing condition to reduce the displacement of P3 in laminitic hooves.

### Hypothesis and Specific Objectives

General Hypothesis: The motion of P3 is differentially affected within unaffected and laminitic hooves by the distinct shoe configurations.

The main objective of this study is to quantify the 3D displacement of P3 alone and relative to the dorsal hoof wall, coronary band and the distal hoof margin in vitro with the use of a real-time motion detection system (Codamotion - Charnwood Dynamics, Ltd).

The focus will be on the distal interphalangeal joint. Therefore, the proximal interphalangeal joint will be immobilized with a dorsal plate and the deep digital flexor tendon affixed to P1, and both will be encapsulated in acrylic within adapters for custom testing fixtures.

### Experimental Design

Unaffected and laminitic hooves (n=7/condition) will be exposed to 5 loading cycles that mimic the physiological ground reaction force of a walking 500 Kg horse (100 to ~5500 N) by a mechanical testing system (MTS, Inc). The experiments will be repeated in hooves with no support or with the use of the following four shoes: standard, egg-bar, heart-bar, and the wooden Steward clog. The locations of the first, second and third phalanx, and the hoof wall margins within a coordinate axis system will be recorded with a wireless motion detection system. The absolute displacement of P3 and the distance of P3 from hoof margins will be continuously calculated at during loading using the 3D Euclidean formula. The effects of condition (unaffected, laminitic) and treatment (unshod, standard, egg bar, heart bar, and Steward clog) on displacement measures will be assessed with repeated measures/mixed-model ANOVA (p<0.1).

Phalanges, and the deep digital flexor tendon will be generated from Computed Tomography (CT) scans of 1 forelimb/laminitic condition/shoeing condition using Avizo 3D Visualization and Analysis software. The 3D models and motion data will be merged to create animations (4D models) illustrating P3 displacement within the hoof capsule under weight-bearing experienced at a walk in an unaffected and a laminitic hoof with and without standard, egg bar, heart bar, and Steward clog shoes.

### Expected Results

We expect that the amount of P3 motion between the two groups of unaffected versus laminitic hooves would be significantly different under all shoeing conditions

### Funding

\$5,700

# Transcriptomic Analysis of Equine Endometrial Cups: Molecular Mechanisms Underlying Development and Degeneration

## Authors/Investigators

Viviane C. L. Gomes, DVM, DACT, Theriogenology Resident and PhD Student

Jenny L. Sones, DVM, PhD, DACT

## Study Summary

The endometrial cups (ECs) are transient placental structures with an essential role in equine pregnancy maintenance. The overarching goal of this proposal is to identify major pathways and key regulators associated with endometrial cup development and demise.

## Hypothesis and Specific Objectives

**Objectives:** To validate the histological characteristics and compare the rate of apoptosis of equine ECs during early development (group 1, 42-47 d, n = 5) and demise (group 2, 96-126 d, n = 5) using hematoxylin-eosin and terminal deoxynucleotide transferase (TdT)-mediated dUTP- digoxigenin nick-end labeling (TUNEL) staining.

**Hypothesis 1:** EC tissues from group 2 will present a higher rate of apoptotic cells and leukocyte infiltration than EC tissues from group 1.

**Objective 2:** To compare the transcriptomic profile of equine ECs during early development (group 1) and demise (group 2) using next-generation RNA sequencing and validate the transcriptomic profile of key differentially expressed genes using quantitative RT-PCR.

**Hypothesis 2:** Key genes associated with pathways of cellular invasion, immunomodulation and induction of apoptosis will be differentially expressed between groups 1 and 2.

## Experimental Design

This study aims to investigate the molecular mechanisms underlying the development and demise of equine ECs from healthy pregnancies. For temporal characterization of the EC transcriptomic profile, two time points of gestation were selected for sample collection: d 42-47 (group 1, n = 5) and d 96-126 (group 2, n = 5), having ovulation as d 0. At d 42-47, the EC

are expected to be achieving maturity: the CG-trophoblast cell migration/invasion has been completed, and the EC-trophoblast cells are terminally differentiated and sessile. In order to assess and validate the developmental stages of ECs collected from the 2 experimental groups, the first objective of this study is to perform histological evaluations and investigation of the rate of trophoblast cell apoptosis via TUNEL assay.

Ten pony mares (4-14 years-old) were bred via natural mating and confirmed to be carrying healthy pregnancies with a single conceptus via serial transrectal ultrasonographic examinations. The mares were randomly assigned to groups 1 (n = 5) and 2 (n = 5) and humanely euthanized at 42-47 d or 96-126 d post-ovulation, respectively.

## Expected Results

The data will provide information about the key molecular pathways leading to EC development and demise, greatly contributing with future investigations of the dynamics of EC trophoblast cells.

## Funding

\$6,000

# Assessment of Plasma Visfatin Concentrations in Horses Administered Lipopolysaccharide and Pentoxifylline

## Authors/Investigators

Lee Ann Fugler, DVM, PhD, Postdoctoral Researcher, EHSP

Britta Leise, DVM, PhD, DACVS-LA

## Study Summary

The overall goal of this study is to determine if visfatin, a proinflammatory adipokine, can be used as a biomarker for experimentally-induced equine sepsis by 1) determining the effects of LPS administration on circulating visfatin in the horse; and 2) determining if treatment with pentoxifylline will inhibit the effects of LPS administration on circulating visfatin in the horse.

## Hypothesis and Specific Objectives

We hypothesize that visfatin can be used as a biomarker for experimentally-induced equine sepsis. We hypothesize that

visfatin will be increased in the circulation of horses in response to LPS administration, and that treatment with pentoxifylline will prevent this LPS-induced visfatin increase.

### Experimental Design

The purpose of this study is to determine if visfatin can be used as a biomarker for experimentally-induced equine sepsis and if pentoxifylline has a modulating effect on this protein. This study will use plasma previously collected and archived from 18 adult horses receiving either IV saline (control, n=6), LPS (LPS, n=6), or pentoxifylline followed by LPS (LPS+PTX, n=6).

### Expected Outcome

The purpose of this study is to determine the effects of LPS administration, as a model of sepsis, on equine plasma visfatin dynamics thereby establishing it as a biomarker for equine sepsis, and to determine if pentoxifylline will have a modulating effect on this protein. We expect that visfatin plasma concentrations will be increased in response to LPS. Treatment with pentoxifylline will decrease plasma visfatin concentrations due to pentoxifylline-associated inhibition of pro-inflammatory cytokines known to induce visfatin, as well as its ability to prevent neutrophil migration and degranulation. The results of this study will establish visfatin as a biomarker for experimentally-induced equine sepsis and help further characterize the effects of pentoxifylline treatment in this and possibly other systemic inflammatory conditions. These results will also serve as preliminary data for further funding to investigate visfatin concentrations in clinical equine sepsis and other inflammatory diseases and to assess its role in hyperinsulinemia/insulin resistance-associated equine laminitis.

### Funding

\$6,000

## mTOR Signaling: A Potential Marker for the Assessment of Therapeutics for Equine Laminitis

### Authors/Investigators

Britta Leise, DVM, PhD, DACVS-LA, Associate Professor, Equine Surgery, EHSP

Rafael R Faleiros, DVM, MSc, DSc., Visiting Professor, Professor, Large Animal Surgery, UFMG, Brazil

Lee Ann Fugler, DVM, PhD

### Study Summary

The overall goals of the proposed study are 1) to determine the expression and localization of effector proteins that result in the activation of the PI3K/Akt/mTORC1 (mTOR) signaling pathway in the digital lamellae from archival lamellar samples from previous studies that exposed horses to insulin dysregulation promoted by a non-fibrous carbohydrate rich (NFCR) diet or to a oligofructose model of sepsis-related laminitis (SRL) model; and 2) to establish if a relationship between these effector proteins and the severity of laminitis exists.

### Hypothesis and Specific Objectives

The development and intensity of lamellar lesions in horses with endocrinopathic and sepsis related laminitis will be positively correlated with the expression of effector proteins related to mTOR signaling. We also hypothesize that the therapeutic procedures employed to prevent the development of laminitis, which proved to be effective in ameliorating lamellar lesions in these horses, will also be effective in reducing the activation of the mTOR pathway.

**Objective 1.** To determine and to compare the protein expression of mTOR signaling in lamellar tissue from horses exposed to NFCR diet before and after insulin dysregulation development.

**Objective 2.** To determine and to compare the protein expression of mTOR signaling in lamellar tissue from horses exposed to SRL (oligofructose) model, treated with red algae extract supplementation or therapeutic leukapheresis.

**Objective 3.** To determine the influence of in vitro neutrophil migration on protein expression of mTOR signaling in cultivated equine keratinocytes.

### Experimental Design

Immunohistochemistry will be used to determine the expression and location of effector proteins of mTOR signaling. Seventy-two archived lamellar tissue samples from 4 groups of horses will be used in this study. These groups are: G1) insulin dysregulation (n=9, 18 total samples taken prior to or 150 days after NFCR diet exposure), G2) septic laminitis control (n=6, 18 total samples taken prior to SRL induction and 12 hours and 36 hours after



SRL induction), G3) septic laminitis treated with Lithothamnium (n=6, 18 samples taken prior to SRL induction and 12 and 36 hours after SRL induction) and G4) septic laminitis treated with leukoapheresis (n=6, 18 samples taken prior to SRL induction and 12 and 36 hours after SRL induction). Comparison of the expression intensity will be made over the various times within each group.

To evaluate the effect of treatment, same comparisons among groups G2, G3 and G4, will be made within each time (prior to and 12 and 36 hours after SRL induction). Effector protein expressions will be correlated with the grade of lamellar damage (see preliminary data above) and with clinical and laboratory parameters recorded during the in vivo experiments.

To complete Objective #3, equine neutrophils will be added to keratinocytes and stimulated with IL-8. Neutrophil migration will be assessed in real-time using the Incucyte® Live-Cell Analysis System. Effects of IL-8 inhibitors will also be evaluated. Keratinocytes and neutrophils will be obtained after stimulation. Protein will be isolated for later analysis via western hybridization for effector proteins of mTOR signaling.

## Expected Results

We expect to have increased mTOR signaling in lamellar tissue after the exposure to the NFCR diet, determining that mTOR signaling is responsible for the development of early signs of lamellar morphologic changes promoted by insulin dysregulation.

Objective 2 outcome: We expect to have increased mTOR signaling in lamellar tissue after SRL induction with the oligofructose. Additionally, we expect that in laminitic horses administered Lithothamnium or treated with leukapheresis will have decreased expression of mTOR effector proteins compared to untreated horses. If true, these findings will confirm the role of mTOR signaling in SRL and will bring novel insights regarding early treatment of sepsis-related laminitis.

Objective 3 outcome: As we have consistent evidence that leucocytes infiltration is proportionally associated with epidermal lamellar dysadhesion in SRL models, a direct correlation between white blood cell migration and the expression of the mTOR pathway effector proteins would be expected. Furthermore, we would expect a beneficial effect of the IL-8 blockers through the decreased migration of neutrophils and lower expression of mTOR effector proteins.

## Funding

\$11,968

# Phylogenomic assessment of USA-based viral isolates of Equine herpesvirus type 1 to improve surveillance and detect novel variants associated with severe host disease

## Authors/Investigators

Andrew Lewin, BVM&S, DACVO; Heidi Banse, DVM, PhD, DACVIM (LAIM); Renee Carter, DVM, DACVO; Lyndon Coghill, PhD

## Study Summary

Next-Generation based sequencing techniques will be employed to determine the viral genome of a specific EHV 1 virus (ORF 30 A2254>G2254). This will provide insights into viral genomics and phylogeny, with full genome identification of field strains quickly becoming the norm.

## Hypothesis and Specific Objectives

We hypothesize that we will identify novel variants in USA-based EHV-1 isolates. We anticipate that these variants could be used to determine the geographic origin of the virus, which will improve capability for surveillance. We also anticipate identifying viral genome novel variants which are associated with particularly severe forms of disease, such as neurological disease and abortion. Genomic and phylogenetic analysis including global isolates will then be performed. As a part of this assessment, we will be specifically seeking novel sequence variants in the USA-based isolates, as well as detecting previously described EHV-1 variants (ORF 30/68) in USA-based isolates.

Objective 2 (O2): To determine if novel and known sequence variants in USA-based isolates are associated with severe forms of disease in host animals (neurological signs and abortion).

## Experimental Design

This investigation utilizes descriptive genome data for EHV-1 isolates for viral genome virulence determinant analysis in relation to severe disease (neurological/abortion) in host horses. USA based EHV-1 isolates will be obtained and then

sequenced using Illumina MiSeq. Archived EHV-1 isolates at veterinary diagnostic facilities across the USA (see letters of support) will be transported to Louisiana State University School of Veterinary Medicine over the course of several weeks using secure, expedited refrigerated shipping. Prior to submission of this proposal we have already identified multiple collaborating centers with approximately 50 total isolates and positive clinical samples of EHV-1 available.

### Expected Results

The results of Objective 1 are expected to yield a comprehensive genomic and phylogenetic analysis of USA-based EHV-1 isolates. We anticipate identifying novel sequence variants in this group which can then be used for future surveillance and diagnostic test design.

### Funding

\$10,725

## Relationship between equine metabolic syndrome, inflammatory cytokines, fecal egg counts, and egg reappearance period in horses

### Authors/Investigators

Erin L. Oberhaus, MS, PhD; Adriano F. Vatta, BVSc, MSc, PhD, DACVM

### Study Summary

The overarching goal of the proposed research is to investigate any potential relationship between equine metabolic syndrome (EMS), inflammatory cytokines, nematode egg shedding, and egg reappearance period (ERP) in horses residing at the LSU AgCenter research farms. Knowledge of interrelationship between these factors has significant clinical relevance in terms of individualizing parasite management of horses with EMS. Equine metabolic syndrome continues to be the most common endocrinopathic disease affecting obese horses and, therefore, remains an important research endeavor amongst veterinarians and endocrine researchers.

### Hypothesis and Specific Objectives

1. Horses with EMS have higher fecal egg counts and shorter egg reappearance periods compared to healthy horses throughout the year.
2. Body condition score, plasma leptin and insulin, and inflammatory cytokines correlate with fecal egg counts and egg reappearance periods.
3. Insulin sensitivity will be altered in horses after anthelmintic administration.

### Experimental Design

Horses owned by LSU School of Animal Sciences and residing at LSU AgCenter Horse Unit and the Reproductive Biology Center will be used for the proposed trial. Bi-weekly fecal egg counts will be determined from May 2021 – May 2022. Re-emergence of parasites will be determined and additional anthelmintic administered accordingly. Assessments of basal circulating leptin concentrations, inflammatory cytokines, and insulin sensitivity will be made throughout the study to correlate with fecal egg counts and egg reappearance period.

All horses (n = 68; mares, geldings, and 1 stallion) housed at the Louisiana State University Agricultural Research Station and the Reproductive Biology Center will be used in this study. Horses will be maintained outdoors with ad libitum access to Bermuda grass pasture and automatic waterers. During the winter months, hay prepared from the same pastures will be supplemented as needed. Protein and mineral tubs will be available ad libitum during times of diminished pasture/hay quality. Body weight and body condition score will be recorded for each horse and will be repeated throughout the study, especially prior to additional anthelmintic administration.

### Expected Results

The LSU AgCenter Horse Unit has historically had a population of mares and geldings that are chronically obese, hyperleptinemic, and insulin resistant. It is expected that a population of horses at both the Horse Unit and Reproductive Biology Center will be identified as obese, hyperleptinemic, and insulin resistant. A healthy population of horses will also be identified. Assessments of parasite burden are currently underway as part of a related project and have revealed significant parasite infection in many horses. We anticipate disappearance of parasites after anthelmintic administration and reappearance of pre-treatment EPG after some time. We

anticipate a correlation between endoparasitism and EMS as well as altered insulin sensitivity in horses after anthelmintic administration.

## Funding

\$12,000

## Total Funded

\$52,393

Beckers, K. F., Sones, J.L. The Effects of Intrauterine Ceftiofur on the Equine Uterine Microbiome, Charles V. Cusimano EHSP Graduate Student Research Grant 2020- 21. \$4,000

Morales Yñiguez F, Takawira C, Mitchell C. Effect of Biological Properties of Cortical Equine Bone after repetitive use of a drill bit. Charles C Cusimano Grant. Equine Health and Sports Performance, \$5,250, September 2022 – Present

St Blanc M, Mitchell C, Leise B. Analysis of the Effects of Clodronate Disodium on Equine Articular Cartilage Using an In Vitro Cell Culture Model. Equine Health Studies Program, \$4,000, September 2020 – Present

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## Grants from Other LSU Institutions

Dern L, Walls C, Gines A, St. Blanc A, Lopez MJ, Liu C., Aulakh K. Achilles tendon reconstruction with bone block: An allograft model and a biomechanical canine cadaveric study. 11/2/2021 – 06/30/2022. Veterinary Clinical Sciences Department. \$4,000.

Spivey K, Aulakh K, Blanc A, Gines A, Walls C, Lopez MJ, Liu C. Biomechanical evaluation of a non-locking pre-manufactured loop suture technique and convergent calcaneal bone tunnels compared to a three-loop pulley suture and divergent calcaneal bone tunnels in a canine calcaneus tendon avulsion model. 11/2/2021 – 06/30/2022. Veterinary Clinical Sciences Department. \$4,000.

Aoun R, Lopez MJ. Shoe configuration effects on the third phalanx motion: In-situ biomechanical investigation in unaffected and laminitic equine hooves. 11/2/2021 – 06/30/2022. Veterinary Clinical Sciences Department. \$4,800.

Taguchi T, Mirza M, Lopez MJ. Therapeutic capacity of stem cell neotissue implants for equine ligament healing. 11/2/2021 – 06/30/2022. Veterinary Clinical Sciences Department. \$4,929.

Aoun R, Lopez MJ. Shoe configuration effects on the third phalanx motion: In-situ biomechanical investigation in unaffected and laminitic equine hooves. 09/01/2021 – 06/30/2022. Equine Health Studies Program. \$5,700.

Xiao N, Lopez M, Osborn M, Takawira C. Development of a staining protocol for micro-computed tomography imaging of equine hoof laminae. 11/02/2020-8/30/2021. Veterinary Clinical Sciences Department. \$4,000.

Taguchi T, Lopez MJ. Healing capacity of implantable collagen constructs for equine tendon regeneration in an elongation-induced rat calcaneal tendinopathy model. 11/02/2020-8/30/2021. Veterinary Clinical Sciences Department. \$3,983.

Lopez MJ, Taguchi T. Implantable collagen constructs for equine tendon regeneration. 09/06/2019 – 08/30/2020. LSU Equine Health Studies Program. \$9,530.

Lopez MJ, Xiao N, Taguchi T. Effects of cryopreservation and fluorescence-activated cell sorting on feline adipose derived-multipotent stromal cell behavior in vitro. 9/1/2019-8/31/2020. Veterinary Clinical Sciences Department. \$4,000.

Castro G, Cremer J, Queiroz-Williams P, Hampton C, Leise B. Toxicity assessment of buprenorphine on equine articular chondrocytes in vitro. VCS Corps Grant, \$3985, October 2019 – 2020.

Cremer J, Queiroz-Williams P, Hampton C, Leise B. Pharmacokinetics and analgesic effects of intra-articular buprenorphine with lipopolysaccharide – induced synovitis in horses. Charles V Cusimano EHSP Grant, \$ 12,000, September 2019 – 2020.

Redmond J, Botting A. Evaluation of Urinary TIMP-2 and IGFBP7 as Early Biomarkers of Acute Kidney Injury in Horses. 2021. LSU Veterinary Clinical Sciences. \$5,000.



Learn more about our equine research  
[lsu.edu/vetmed/ehsp](https://lsu.edu/vetmed/ehsp)

### Grants from Other LSU Institutions continued

Lewin A, Carter RT, Banse H, LC. Phylogenomic assessment of USA-based viral isolates of Equine herpesvirus type 1 to improve surveillance and detect novel variants associated with severe host disease. August 2021 - June 2022. Charles V. Cusimano Equine Health Studies Program Research Grant. \$10,725.00

Carter RT, Lewin A, Astete C, Sabliov C. Evaluation of nanoparticles as a carrier for hydrophobic drug diffusion through equine cornea. November 2020 – June 2021. Veterinary Clinical Sciences Competitive VCS CORP. \$2,950.00

Carter RT, Lewin A, Langohr I, Sabliov C. Evaluation of the in vitro effect of nanoparticles on equine corneal explants. September 2019 - June 2020. Charles V. Cusimano Equine Health Studies Program Research Grant. \$4,512.74

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## Grants from non-LSU Institutions

Andrews, F.M., Riggs, L.M., Chapman, A.M. Mild/Moderate Asthma Study 2022. Sponsored by Hilltop BioScience, Inc., Private, To be funded. \$84,000

Andrews, F.M., Chapman, A.M., Balasuriya, U. EHV-1 Specific Immune responses to EHV Vaccines in horses. Boehringer-Ingelheim Animal Health, Private. \$80,888.

Andrews, F. M., Chapman, A., Gray, L. "Effects of a Supplement Containing Siberian Ginseng on Health and Behavior in Horses." Sponsored by SmartPak, LLC. Private, September 1, 2021 – January 31, 2022. \$40,000.

Andrews, F. M. Chapman, A., St. Blanc, M., Kennedy T., Okeefe, T. Pivotal Study: Pivotal Study: A 2-treatment 3-sequence Partially Replicated Crossover (including RSABE analysis) Bioequivalence Study with Gastroguard Formulation Versus Generic Omeprazole Formulation in Horses (NADA 141-123), Randlab Pty, Ltd., 7/85 Alfred Road, Chipping Norton, NSW, Australia 2170, \$280,704 February 11, 2021 – January 31, 2022.

Andrews, F. M., St. Blanc, M., Chapman, A., Gray, L. "Effects of a Supplement Containing CBD on Sedation, Ataxia Scores and Equine Health Parameters." Sponsored by SmartPak, LLC. Private, August 31, 2020 – December 31, 2021. \$51,000.

Andrews, F. M., Chapman, A., Gray, L. "The Effects of Turmeric and Devils Claw on Equine Gastric Ulcer Score." Sponsored by

SmartPak, LLC. Private, August 31, 2019 – December 31, 2020. \$60,000.

Gomes, V.C.L., Magee, C., Sones, J.L. Kisspeptins as pro-apoptotic mediators during equine endometrial cup demise, Theriogenology Foundation, 2020-21. \$5,000

McNulty, M. A., Mitchell, C. F., Allen, M. R. Effect of tiludronate on bone remodeling and regeneration in horses, Morris Animal Foundation, \$116,707.00, May 2019 - June 2022

Balasuriya, U. Carossino, M. Infrastructure funding to help support participation in the NAHLN Level 1 (RFA 2021) grant to Louisiana Animal Disease Diagnostic Laboratory. Grayson-Jockey Club Research Foundation, Inc. 2021-2023

Balasuriya, U. A novel mechanism of viral immune evasion: Hijacking and exploitation of the CXCL16/CXCR6 chemokine axis by equine arteritis virus during persistent infection in the stallion reproductive tract. NIH-USA NIFA R01 Research Grant Program Dual Purpose with Dual Benefit: Research in Biomedicine and Agriculture Using Agriculturally Important Domestic Animal Species. 2019-2024. \$1,625,000

Paul L, Banse H. Bile acid profiling of pyloric gastric fluid and serum in horses with and without glandular gastric disease. American Quarter Horse Foundation. 2022-2023. \$19,816.

McCue M, McFarlane D, Hughes L, Paradis MR, Schott H, van Eps A, Kritchevsky J, Banse H. Investigation of genetic risk alleles for pituitary pars intermedia dysfunction. Morris Animal Foundation. 2020-2022. \$58,959 USD.

Banse H, Whitfield-Cargile C, Ericsson A, Andrews F. Impact of concurrent treatment with omeprazole and phenylbutazone on gastrointestinal health in horses. EHSP Charles V. Cusimano Research Grants (LSU Vet Med). 2020-2021. \$8,000 USD.

Whitfield-Cargile C, Banse H, Coleman M, Chamoun A. Impact of the combination of phenylbutazone and omeprazole on the equine gastrointestinal tract. Texas A & M Veterinary Large Animal Clinical Sciences Grant, 2020. \$12,500 USD.

Aoun R, Lopez MJ. Shoe configuration effects on the third phalanx motion: In-situ biomechanical investigation in unaffected and laminitic equine hooves. 01/01/2022 – 12/31/2022. Sigma Xi. \$1,000.

Cardin R, Baines J, Chouljenko V, Dugas T, Francis F, Guerrero-Plata M, Kousoulas K, Langohr I, Lopez MJ (Co-I, Center Co-director), Subramanian R, Wen X, Withers S, Gines A, Johnston A, Yi X, Martin E. 04/01/2021-03/31/2026. Center for Pre-Clinical Cancer Research, National Institute of General Medicine Sciences. \$11,192,691.

Lopez MJ, Taguchi T, Takawira C. Implantable collagen constructs for equine tendon regeneration. 5/1/2020 – 4/30/2022. American College of Veterinary Surgeons Foundation. \$9,950.

Yao S, Lopez MJ, Li S. Molecular basis for the loss of differentiation capability in human bone marrow stem cells during expansion. 08/17/2020 – 07/31/2022. National Institute of Arthritis and Musculoskeletal and Skin Diseases. \$191,686.

Lopez MJ. Tynewald Foundation Regenerative Medicine Fund. 12/15/2019 – 12/14/2022. Tynewald Foundation. \$408,000.

Lopez MJ, Taguchi T. Implantable collagen constructs for equine tendon regeneration. 10/01/2019 – 09/30/2020. USDA 1433. \$7,468.

Lopez MJ. Porcine model for spinal cord reconstruction/regeneration after blunt injury. 07/01/2019 – 06/30/2021. WellStar Atlanta Medical Center. \$85,186.

Lopez MJ. Evaluation of partial depth pavement repairs on routes heavily traveled by Amish horse and buggies. 01/09/2019 – 03/15/2020. Ohio University. \$27,000.

Lopez MJ. Hybrid synthetic/biological scaffolds for complex

orbital reconstruction. 09/28/2018 – 08/31/2020. Johns Hopkins University. \$133,797.

Carossino, M. Infrastructure funding to help support participation in the NAHLN Level 1 (RFA 2021) grant to Louisiana Animal Disease Diagnostic Laboratory. Grayson-Jockey Club Research Foundation, Inc. 2021-2023.

Balasuriya, U.A. A novel mechanism of viral immune evasion: Hijacking and exploitation of the CXCL16/CXCR6 chemokine axis by equine arteritis virus during persistent infection in the stallion reproductive tract. NIH-USDA NIFA R01 Research Grant Program Dual Purpose with Dual Benefit: Research in Biomedicine and Agriculture Using Agriculturally Important Domestic Animal Species. 2019-2024. \$1,625,000.



# Facilities and Equipment



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he Equine Health and Sports Performance (EHSP) program is an interdepartmental, multidisciplinary equine biomedical program within the LSU School of Veterinary Medicine that is dedicated to the health, well-being, and performance of horses through veterinary research, education, and service. A diverse group of faculty, graduate students, post-doctoral fellows, and staff conduct cutting-edge research in equine health and disease. The program maintains a herd of approximately 90 horses and ponies for teaching and research. Three research barns in the facility contain over 40 stalls and several pastures and paddocks are available for turnout and housing. We have five labs dedicated to equine research, as well as the resources of the LSU Vet Med Veterinary Teaching Hospital, which features advanced diagnostic imaging facilities and more.



*Dr. Laura Riggs,  
equine surgeon and  
researcher*

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## Charles V. Cusimano Equine Physiology and Pharmacology Laboratory

Numerous faculty and graduate students conduct scientific investigations involving equine physiology, pharmacology, and pathophysiology, including but not limited to vascular and nonvascular smooth muscle physiology, pathology, and pharmacology (digital and intestinal vasculature, bronchial, uterine and intestinal smooth muscle), mucosal injury due to non-steroidal-anti-inflammatory drugs, mucosal physiology and permeability, endotoxemia, laminitis, and development and testing the effects of medications on hemodynamics. We currently have 15 Ussing chambers systems and multiple tissue baths for measuring gastrointestinal mucosal permeability and injury and muscular contraction.

## Pfeiffer-Burt Lameness and Performance Pavilion

The Pfeiffer-Burt Lameness and Performance Pavilion (75' x 125') is a modern facility for evaluation of locomotion in horses. Several research projects evaluating the efficacy of pharmaceutical and nutraceutical agents and feed additives for treatment of lameness in horses are being evaluated in this facility.



## WE HAVE FIVE LABS DEDICATED TO EQUINE RESEARCH, AS WELL AS THE RESOURCES OF THE LSU VET MED VETERINARY TEACHING HOSPITAL, WHICH FEATURES ADVANCED DIAGNOSTIC IMAGING.



### Equine Performance Evaluation Laboratory

The Equine Performance Evaluation Laboratory (EPEL) is equipped with a high-speed treadmill for exercising horses at speeds that mimic racing conditions. A Coda Motion System digital motion analysis system that incorporates markers on the horse into digital images to evaluate gait and lameness is also available. Evaluation of the dynamics of the upper airway can be achieved by a dynamic endoscopic system. The dynamic endoscope can evaluate the upper airway in research and clinic horses exercising on the high-speed treadmill or working in their natural environment, such as the racetrack or riding arena.

### Laboratory for Equine and Comparative Orthopedic Research

The Laboratory for Equine and Comparative Orthopedic Research (LECOR) was

established and designed to facilitate a strong association between clinical and basic orthopedic research for advancement of orthopedic knowledge across species and disciplines. LECOR is specifically designed and equipped for translational orthopedic research from the molecular/genetic level to the structural level.

The laboratory is equipped with the most modern equipment for molecular/genetic work, including an MJ Research Chromo4 Detector and DNA Engine 200 for DNA fragment amplification and Quantitative PCR, a UVP hybridlinker for blot analysis and a Synergy HT multi-detection microplate reader for ELISA assays. Housed within the laboratory is a Leica DM 4000 light microscope with fluorescent, polarizing, and phase contrast capabilities. The microscope is equipped with the latest in digital image capture equipment and software. Additionally, there is a PathScan Enabler to obtain ultra high quality images from 1 x 3 inch glass slides. A custom-designed servohydraulic axial torsional Material Testing System with a Flex Test SE Controller and equipped with a Multiple Gage Length Axial Extensometer

makes nearly any level of mechanical tissue testing possible, from the tissue and bone level to joint and whole limb testing. Presently, several state-of-the-art diamond saws are available for both orthopedic hard and soft tissue microscopic and ultrastructural sample preparation. A section of the laboratory is devoted to histologic preparation of both calcified and decalcified tissue samples. Areas of research focus include the pathophysiology of hip dysplasia, the development and implementation of novel orthopedic devices and cranial cruciate ligament disease. Also, the laboratory is active in equine stem cell research, regenerative medicine and tissue culture. The laboratory focuses on translation of basic scientific research to the live horse. Projects within the laboratory include growth of laminar cells for use as an in vitro model of laminitis and bone marrow stem cells for use in tendon healing.

### Equine Orthopedics and Biomechanics

We have developed a solid research program in the area of equine orthopedics

and biomechanics. This has led to the development of numerous orthopedic implants designed specifically for equine use, which is critical for the advancement of equine orthopedics and fracture repair. These equine specific orthopedic implants have distinct advantages over those intended for human application. The EHSP is unique in that it is part of the only school of veterinary medicine in the country that is designing and testing equine specific orthopedic implants. An integral part of this research program was the development of a finite element computer model that allows for the biomechanical testing of an orthopedic implant applied to an equine bone or bones. This allows for changes in implant design to be made and tested using the finite element model prior to in vitro biomechanical testing. This computer aided design approach allows for more efficient use of the limited cadaver specimens. This research has direct and often immediate clinical applications. We are presently advising and performing biomechanical tests on prototype large animal orthopedic implants for Synthes Vet, Inc., Innovative Animal Products, and IMEX Veterinary, Inc.

*Dr. Mandi Lopez is the director of the Laboratory for Equine and Comparative Orthopedic Research.*



### Clinical Facilities and Equipment

The LSU Veterinary Teaching Hospital is staffed 24/7, 365 days a year with board certified and internationally recognized veterinary specialists and highly-skilled veterinary technicians who provide clinical service to the horse-owning public.

### Computed Tomography

The Veterinary Teaching Hospital's Diagnostic Imaging Service is equipped to provide

its patients with clinical diagnostic imaging. On-site diagnostic imaging includes computed tomography, as well as Large and Small Animal radiography, digital fluoroscopy, ultrasonography, magnetic resonance imaging, and nuclear scintigraphy.

### MRI Unit

In 2009, the LSU Veterinary Teaching Hospital added a state-of-the-art MRI unit for evaluation of soft tissue and bony lesions in the head, neck, and limbs of horses with hard to diagnose clinical conditions, including foot and lower limb

lameness. Plans have been submitted for installation of a new MRI unit in 2025.

### Diagnostic and Research Endoscopy

The hospital also has digital endoscopy equipment (Karl Storz, Inc.) to diagnose conditions of the upper and lower airways, esophagus, stomach, proximal duodenum, and reproductive tract.



## Equine Reproduction/ Theriogenology Laboratory

The Equine Reproduction/Theriogenology Laboratory has complete facilities for the evaluation, chill-transport, and cryopreservation of spermatozoa, including light and phase-contrast microscopes and a computer-assisted spermatozoal analysis system (Spermvision®). There are three ultrasound machines with 5-7.5 MHz linear array transducers and a 5-7.5 MHz sector array transvaginal transducer for oocyte collection by follicular aspiration or twin reduction by aspiration. A fourth ultrasound system equipped with a 3.5 sector and 5-7.5 microconvex array is available for transabdominal imaging. An Olympus endoscope is also available for hysteroscopic examination and for hysteroscopic low-dose insemination. Various laparoscopic reproductive procedures are available.

## Comparative In Vitro Fertilization Laboratory

The comparative in vitro fertilization laboratory of the Theriogenology section is a state-of-the-art designed for conducting advanced studies on gamete and embryo biotechnology of domestic and wild animal species. In horses, intracytoplasmic sperm injection is currently the only successful procedure used to produce horse embryos in vitro. Several graduate students and residents have been trained in advanced

assisted reproduction techniques that are currently used in research studies and reproductive management of horses.

## Equine Molecular Biology Research Laboratory

The Equine Molecular Biology Research Laboratory is equipped to support the molecular biology aspects of research conducted by the EHSP investigators. The missions of this laboratory are to perform research to explain the molecular basis of disease with a view to improved clinical approaches; to train scientists, students, and visitors at all levels; and to develop new instruments and methods in equine molecular biology. We also have direct access to the core facilities within the LSU Vet Med Division of Biotechnology and Molecular Medicine (BIOMMED) for quantitative Real-Time PCR, primer/probe design, Quantity One for DNA fragment visualization and analysis, SDS-PAGE analysis, MagnaPure automated nucleic acid extraction, and microarray spotters and readers. Current investigations utilizing this laboratory include study of key mediators in equine laminitis, metabolic disease, gastrointestinal disease, summer pasture-associated recurrent obstructive airway disease, bone healing and mechanisms of pain sensation and modulation. The capabilities of this laboratory have expanded in light of the increasing importance of the molecular biological approach to the investigation of equine health and disease.

# Effects of Daily Oral Administration of Siberian Ginseng on Health and Behavior in Horses

## Authors/Investigators

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LSU Equine (Equine Health Studies Program), LSU Vet Med, Baton Rouge, LA.

## Introduction

Herbal supplements are more commonly being administered to horses to maintain health and wellbeing. Supplements containing Siberian ginseng (*Eleutherococcus senticosus*) have been shown to support proper metabolism and a healthy immune system, as well as fight fatigue and ameliorate oxidative stress in horses. Although the FDA does not regulate the market for these supplements, there are laws in place to enforce “warning disclosures.” However, there is a lack of published evidence demonstrating these potentially adverse effects. The purpose of our study is to determine if the administration of a supplement containing Siberian ginseng results in hypertension, anxiety, or hypoglycemia in horses.

## Hypothesis

We hypothesize that daily oral administration of a supplement containing Siberian ginseng will not cause or exacerbate increased blood pressure, hypoglycemia, or increased anxiety in normal, healthy, adult horses.

## Experimental Methods

Sixteen clinically healthy adult Thoroughbred horses were housed in stalls for 35 days – 7 days acclimation period plus 28 days study. Before treatment was initiated, blood work (CBC and biochemical panel) was evaluated and horses underwent a physical examination to ensure all subjects were healthy. The horses were randomly assigned to treated (N=8; supplement pellets containing SBG, 1,000 mg) or control (N=8; supplement pellets without SBG) groups (Fig 1). Horses were supplemented daily and subjected to a novel object test (NOT) on days 0 and 28. Blood pressure was measured on days 0, 15 and 28 (Fig 1). Anxiety scores were assigned by a masked observer based on

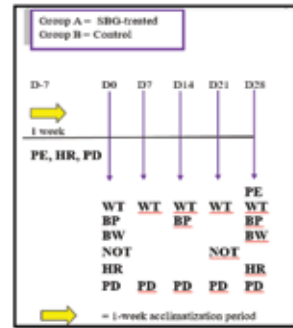


Figure 1. Experimental design of the 28-day feeding of a supplement containing Siberian Ginseng (SBG). D=day, WT=body weight, BP=blood pressure, NOT=novel object test, PE=physical exam, HR=heart rate, PD=pedometer.

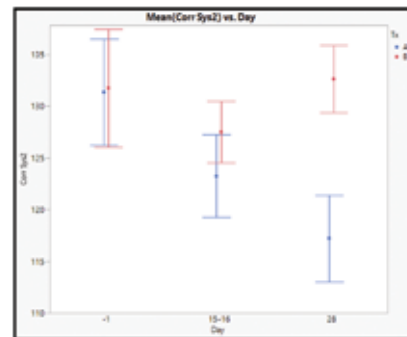
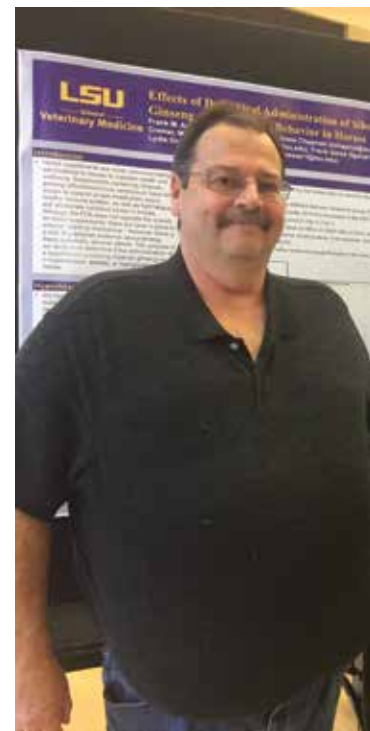


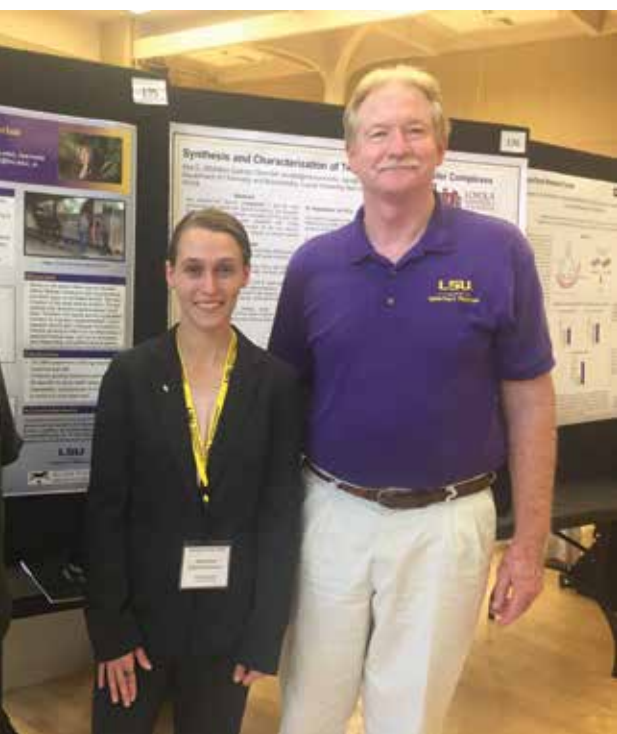
Figure 2. Mean difference in pressure in Siberian ginseng-treated (A) and control (B) horses on days 0, 15 and 28 of administration. Systolic blood pressure significantly ( $P<0.05$ ) decreased by Day 28 in the treated group.



the reaction to the NOT test (Table 1). Plasma ACTH was measured before and after the NOT. Horses were monitored daily for clinical signs or adverse events. Blood work was also evaluated on days 28, two hours after administration of the supplement.

## Results

The supplement was readily consumed by the horses and no adverse effects were seen over the treatment period. Anxiety scores were not significantly different between treatment groups (Fig 3). Mean systolic blood pressure significantly ( $P < 0.05$ ) decreased in the SBG-treated group by day 28 when compared to Day 0 (Fig 2). Siberian ginseng treatment did not have an effect on heart rate or blood values-including glucose, indicators of anemia, blood proteins, liver enzymes, kidney values, electrolytes, calcium or ACTH. Body weight did not change in either treatment group throughout the study.



**Siberian ginseng continued**

Discussion/Clinical Implications

The SBG supplement (1,000 mg) was readily consumed and safe.

A Siberian ginseng supplement administration for 28 days did not cause health issues, or result in hypertension, hyperglycemia, or increase anxiety or stress to a novel object test.

This research did not investigate the benefits of Siberian ginseng to determine its effectiveness in assorted medical uses, such as its antioxidant, anti-inflammatory, and antimicrobial properties. However, the supplement does appear safe.

Acknowledgments

The authors would like to thank all of the student workers and lab assistants that helped with this project. In addition, we express deep gratitude to SmartPak® Equine, Inc. for their funding and providing supplements to make this study possible.

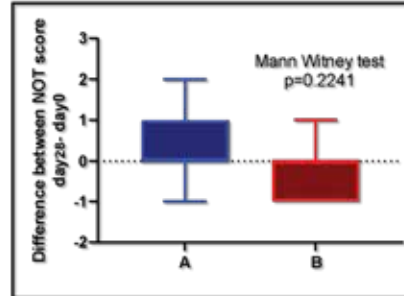


Figure 3. Mean difference in anxiety scores between the novel objective tests on Day 0, before administration of Siberian ginseng, and after 28 days of supplement administration in treated and control groups. No significant difference was seen between treatment (A) and controls (B).

<b>Anxiety Score to evaluate reactivity during the NOT</b>	
<b>Score</b>	<b>Description</b>
<b>1</b>	Horse shows no reaction or interest in the stimulus.
<b>2</b>	Horse looks in the direction of the stimulus but has no other reaction.
<b>3</b>	Horse jumps when stimulus is applied but does not try to run away.
<b>4</b>	Horse jumps away from the stimulus and tries to leave.
<b>5</b>	Horse completely loses control and tries to flee or refused to move from the spot.

Table 1. Anxiety Grading Scale to Novel Object test (NOT)



*Fig 1. Gastroscopy was performed on each horse using a 3.0 meter video endoscope attached to a video screen and light source (Karl Storz Endoscopy, Goleta Heights, CA).*

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## **The Effects of Turmeric and Devils Claw on Equine Gastric Ulcer Scores**

### **Authors/Investigators**

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Equine Health Studies Program, Department of Veterinary Clinical Sciences, School of Veterinary Medicine, Louisiana State University, Baton Rouge, LA

Tumeric and Devil's Claw continued

Introduction

Turmeric and devil's claw are botanicals that have been shown to decrease inflammation and pain due to osteoarthritis (OA). The United States Food and Drug Administration (FDA) requires a warning label stating "these supplements may cause or worsen gastric ulcers". However, there is lack of supporting evidence for this claim. Because these supplements could be a possible replacement for NSAIDs, which have been shown to cause or worsen ulcers, safe natural alternatives would be helpful to ease pain in horses.

Hypothesis

Turmeric and/or devils claw administered to horses in a supplement once daily for 28 days does not worsen gastric ulcer scores.

Experimental Methods

12 Thoroughbred horses with gastric ulcers were identified via gastroscopy (Fig 1) (Day 0) to establish susceptibility to ulcer development. Horses were fasted for 16-18 hours and water was not withheld prior to gastroscopy. Xylazine (0.4mg/kg BW) for sedation was given before passing the gastroscope.

Each horse's stomach was given an equine gastric ulcer syndrome (EGUS) score based on size of ulcers and a number and severity (NGN and NGS) score based on ulcers present in both the glandular and non-glandular regions of the stomach. Gastric juice pH was measured. Horses were stratified by EGUS score and allocated to two treatment groups. Supplements

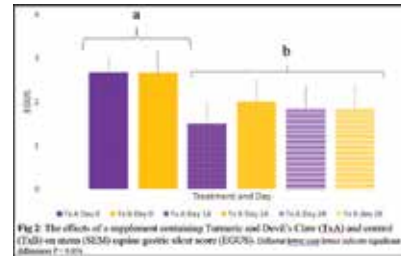


Fig 2: The effects of a supplement containing Turmeric and Devil's Claw (TxA) and control (TxB) on mean (SEM) equine gastric ulcer score (EGUS). Different lower case letters indicate significant differences  $P < 0.05$ .

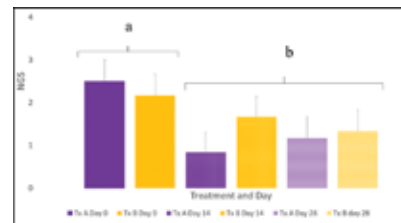


Fig 3: The effects of a supplement containing Turmeric and Devil's Claw (TxA) and control (TxB) on mean (SEM) non-glandular ulcer severity score (NGS). Different lower case letters indicate significant differences  $P < 0.05$ .

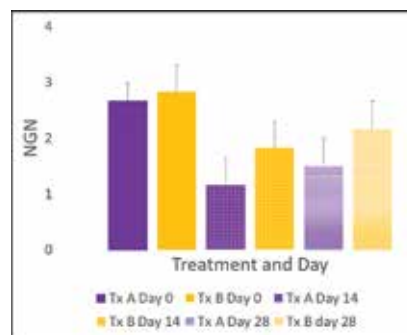


Fig 4. The effects of a supplement containing Turmeric and Devil's Claw (TxA) and control (TxB) on mean (SEM) non-glandular ulcer number score (NGN). No significant ( $P=0.0689$ ) difference.



were shipped by SmartPak® identified by A and B so that persons administering the supplement, examining the horses and the investigator (FMA) scoring the ulcers were masked to treatment. Gastrosopies with ulcer scoring and gastric pH sampling were repeated at day 14, and 28 of treatment.

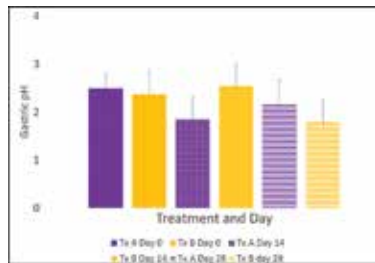


Fig 5. The effects of Turmeric and Devil's Claw (TxA) and control (TxB) on mean (SEM) gastric juice pH. No significant ( $P=0.1555$ ) difference was seen.

## Results

Mean EGUS (Fig. 2) and NGS (Fig. 3) scores were significantly lower in both treatment groups by Day 14 and 28, when compared Day 0. Mean NGN (Fig. 4) was lower on Days 14 and 28 when compared to Day 0, but this was not significant. No treatment effect was noted on Day 14 or 28 of the study.



Figure 6 A-D: 604 (Treatment A) Day 0 Greater curvature, B- Day 0 Pyloric sphincter, C- Day 14 Greater curvature, D- Day 14 Pyloric sphincter.

Gastric juice pH (Fig. 5) was low throughout the study on both treatments.

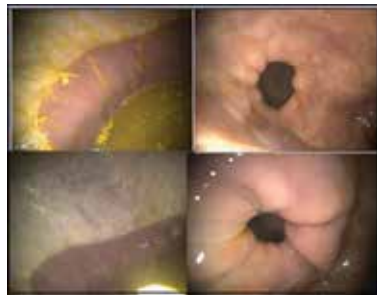


Figure 7 E-H: 441 (Treatment B) Day 0 Greater curvature, B- Day 0 Pyloric sphincter, C- Day 14 Greater curvature, D- Day 14 Pyloric sphincter.

## Conclusions

The supplement containing Turmeric and Devil's Claw was palatable and safe in the horses.

Gastric ulcer size and severity decreased in both treatment groups after 14 and 28 days of treatment and no treatment effect was seen.

A supplement containing Turmeric and Devil's Claw fed to horses for 28 days did not increase size or severity of gastric ulcers.

# Plasma F-Actin Concentrations in Horses Administered Lipopolysaccharide

## Authors

Fugler LA, Bell HL, Kock CE, Keowen, Leise BS

## Introduction

Sepsis is a common sequela to gastrointestinal disease in the horse resulting in an overwhelming inflammatory response. Determining biomarkers of sepsis in horses could serve to guide therapies and help predict outcomes in critical patients. Actin is an inflammatory protein present in cells that can be released into the circulation in response to injury or infection.

## Hypothesis

We hypothesized that concentrations of F-actin in the blood of horses would be increased in horses administered lipopolysaccharide (LPS).

## Experimental Methods

Horses received either LPS or saline and blood samples were collected at specified times over a 48 hour-period. Physical examinations were also performed throughout the study. F-actin, inflammatory cytokines (TNF- $\alpha$ , IL-10), and lactate were measured in the blood.

## Results

Rectal temperature and heart rate was increased early in the study period but returned to normal by 8 hours post-administration (Figure 1). While there was no difference in F-actin concentrations between the saline and LPS treated horses (Figure 2), concentrations of lactate, TNF $\alpha$  and IL-10 were increased in the LPS treated group early in the study period.



## Conclusions and Future Studies

While LPS did result in a systemic inflammatory response no difference in F-actin concentrations between groups were noted. It is likely that experimental administration of low-dose LPS does not result in enough tissue damage to cause a significant release of actin filaments into the circulation. In conclusion, F-actin does not appear to be a useful biomarker in this experimental model of sepsis; however, further evaluation in clinical cases with more severe disease is warranted.

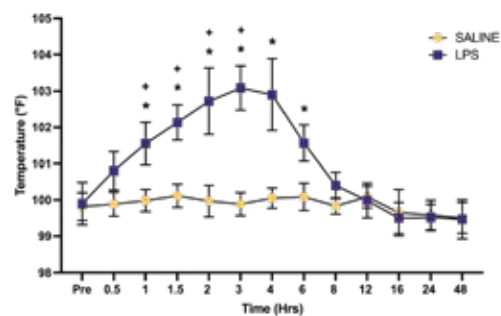


Figure 1: Rectal temperature over time in LPS administered horse (purple) and saline (yellow). \*Significant ( $p \leq 0.05$ ) difference between saline and LPS groups. +Significant difference from baseline value (Pre) for LPS group.



# Foal Outcomes from Mares Experiencing Colic in the Gestational Period

## Authors

Middlebrooks Q, Liu C, Fugler LA, Leise BS

## Introduction

Foal outcome is a major concern for owners when determining treatment options for colic in the pregnant mare. Factors predicting foal outcome have not been evaluated in great detail; however, in mares requiring surgical intervention, several risk factors have been identified including prolonged anesthetic duration, intra-operative hypotension and hypoxemia and gestational age of the fetus. Systemic Inflammatory Response Syndrome (SIRS) is often present in horses with more severe causes of colic and has been associated with an increased risk of death in horses with gastrointestinal disease.

## Hypothesis

We hypothesize that gestational age of less than 40 days will have decreased foal survival and that decreased foal survival will be found in broodmares that demonstrate signs of systemic inflammatory response syndrome when presenting for colic.

## Experimental Methods

This was a retrospective study that analyzed records from horses presenting for colic to the LSU Equine Clinic. Records from 2011-2019 of any pregnant mares experiencing colic that were treated medically or surgically were included. Data collected from each case included: mares age, foal gestational age, admitting physical exam and colic exam findings, presence of SIRS, medical or surgical management of colic and foal outcome. SIRS was diagnosed when 2 or more of the SIRS criteria were present (Table 1).

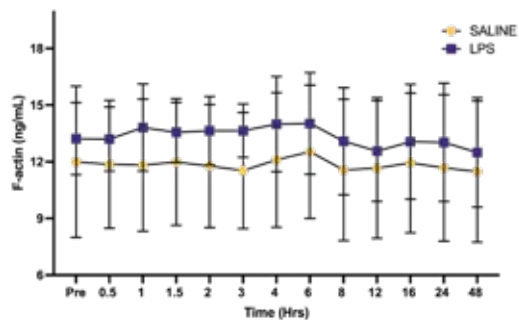


Figure 2: Mean ( $\pm$ SD) F-actin concentration (ng/mL) of horses administered saline (control) or LPS. There was no significant differences noted over time within groups or between groups through the study period.

SIRS Criteria	
Heart rate	> 50 bpm
Respiratory rate	> 30 bpm
Rectal temperature	> 101.5° F or < 99° F
White blood cell count	> 10x10 <sup>9</sup> cells/ul or < 5x10 <sup>9</sup> cells/ul

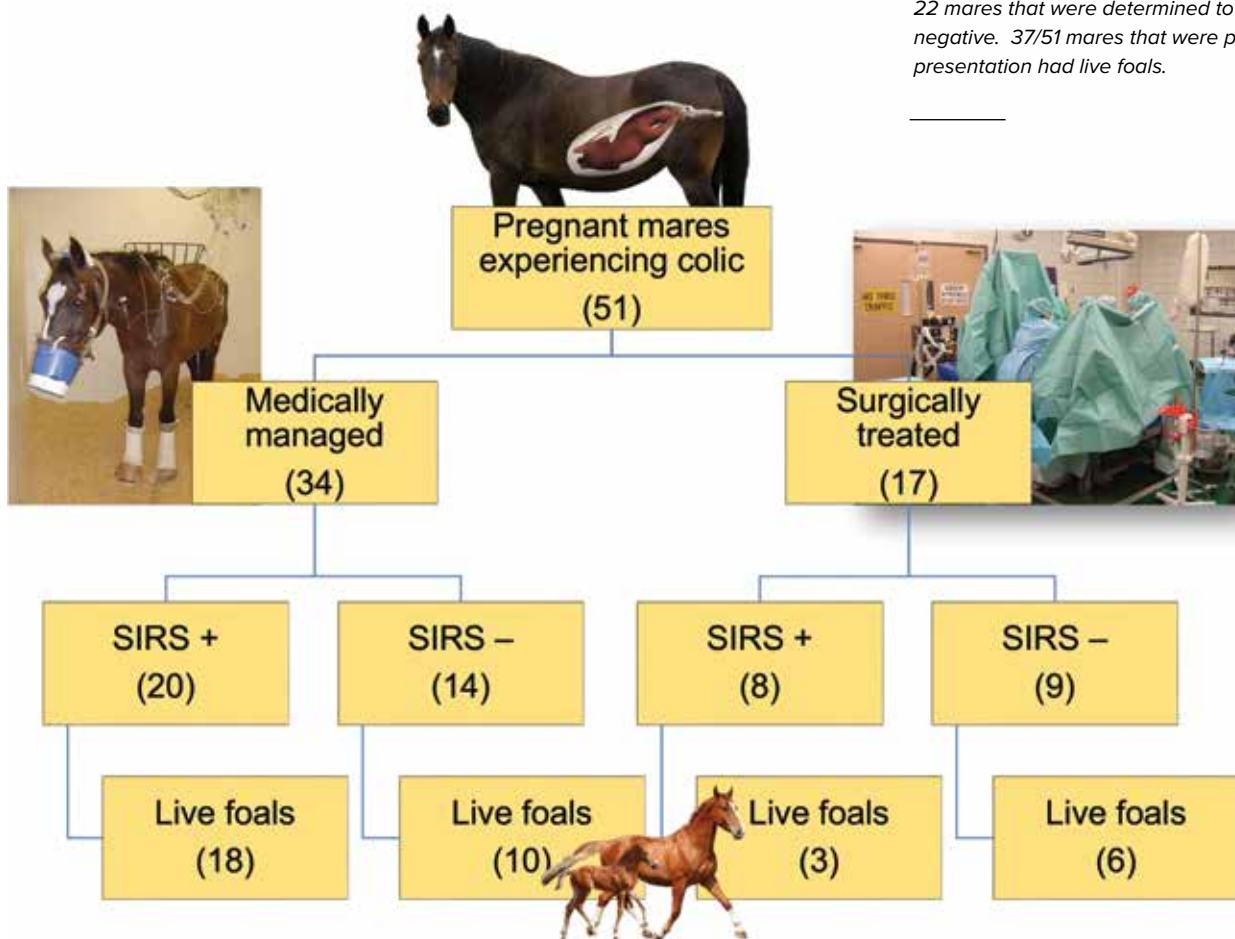
**Foal outcomes continued**

Results

Fifty-one mares were included in this study (Figure 1). The odds of having a live foal was 4.86 times higher if mare was medically managed rather than surgically managed (Figure 2). Mares were more likely to have a live foal if they had a lower PCV on admissions. While gestational age did not significantly affect foal outcome there was a greater proportion of mares at > 40 days of gestation to have live foals (Figure 3). SIRS upon admission correlated with heart rate,  $p=0.5279$ . There was a trend for mares with higher heart rates on admission to have decreased foal survival (Figure 4).

Conclusions and Future Studies

While there was no significant difference noted for foal outcome based on gestational age, it is worth noting that a trend was evident in result of a live foal correlating with a later gestational age and lower heart rate. The inclusion of more cases would increase the power of this study and data from this study can be used to design a prospective study evaluating foal outcome in mares with colic.



*Figure 1: Fifty-one mares met the inclusion criteria for this study. There were 28 mares that demonstrated  $\geq 2$  signs of SIRS and 22 mares that were determined to be SIRS negative. 37/51 mares that were pregnant on presentation had live foals.*

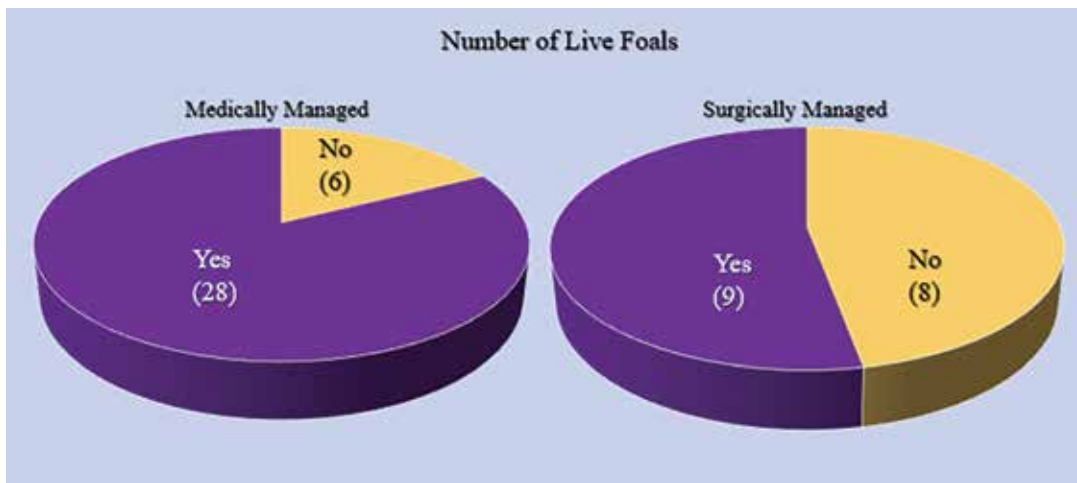


Figure 2: Mares were significantly more likely to have a live foal if treated medically ( $P=0.020$ ) vs. surgically.

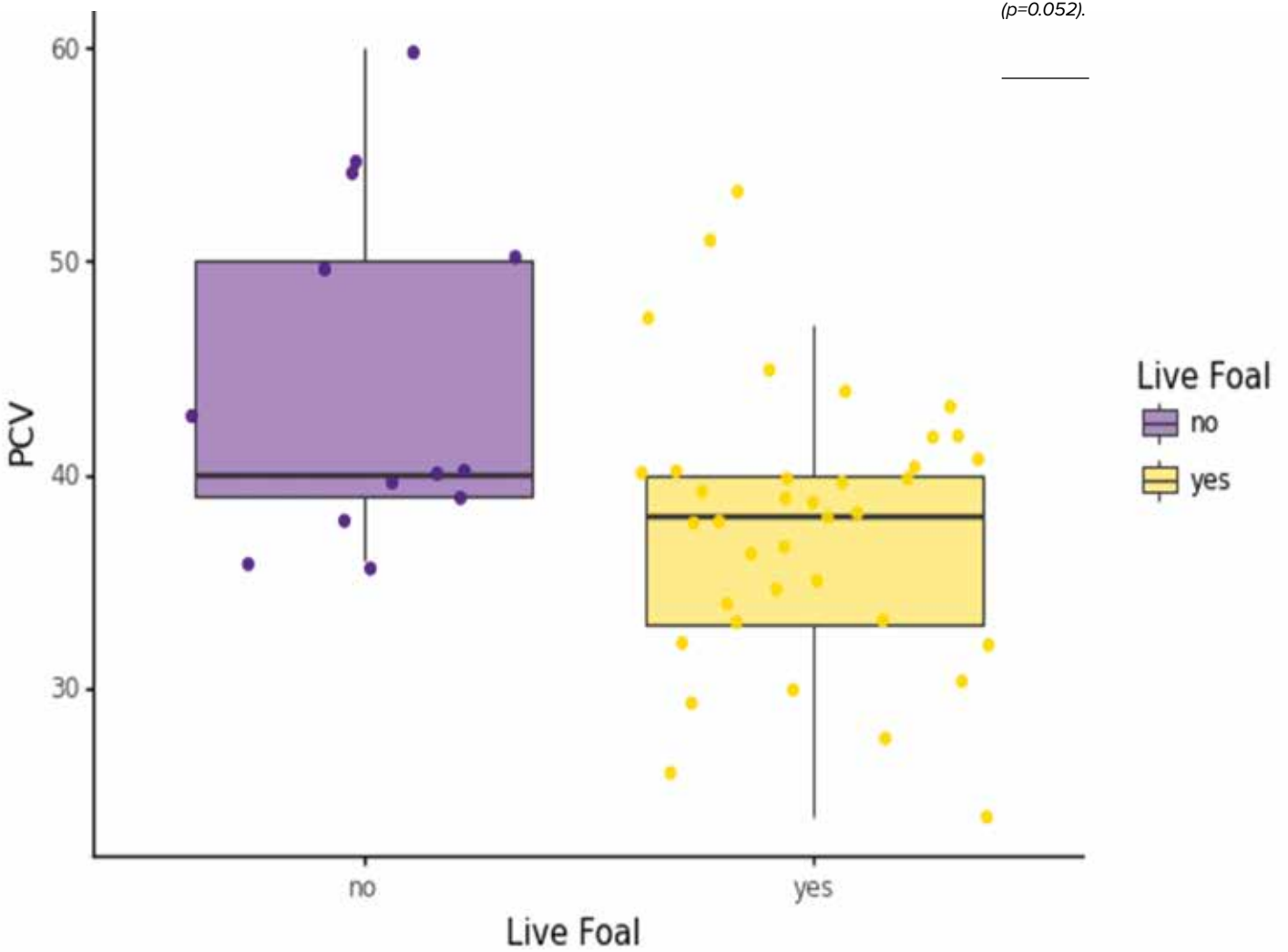


Figure 3: Mares with lower packed cell volume (PCV) were more likely to have a live foal ( $p=0.052$ ).

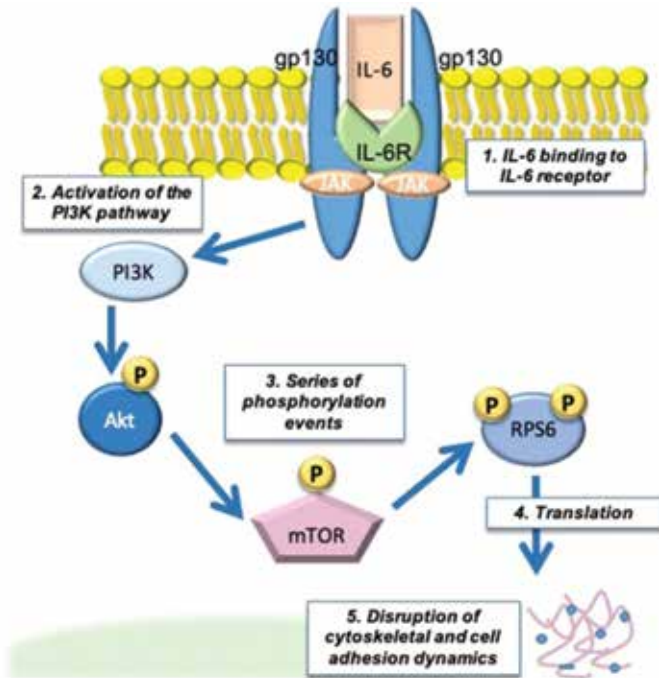


Figure 1: IL-6, which is greatly increased in the lamellar tissue in horses with sepsis-related laminitis binds to its cell membrane receptor and activates mTOR signaling. Its downstream effector protein, RPS6, is activated through phosphorylation resulting in damage to the cell.

## Immunolocalization of Phosphorylated-RPS6 Varies in the Lamellar Tissue of Horses at Different Stages of Sepsis-Related Laminitis

### Authors

Falerios R, Catunda A, Leise BS

### Introduction

It has recently been proposed that the mTOR/RPS6 signaling pathway, a well preserved and physiological pathway that promotes cell growth and proliferation, also plays a central role in the development of the three main types of laminitis: endocrinopathic, sepsis-related and support limb. Developing a better understanding of this pathway in sepsis-related laminitis could lead to improved therapeutics for this devastating condition.

### Hypothesis

Phosphorylation of ribosomal protein 6 (pRPS6), a downstream signaling marker in the mTOR pathway, would increase early in the developmental period (ETP) and continue to increase as lameness worsened (from LAM to OG3).

### Experimental Methods

Archived formalin-fixed lamellar tissue was used to localize expression pRPS6 and calprotectin through immunohistochemistry. Positive cells were counted in the different regions of the lamellar tissue and compared between the different stages of laminitis.



Figure 2: pRPS6+ cells in the lamellar tissue from horses with sepsis-related laminitis. (A) no laminitis (baseline) (B) during the development of laminitis but with no lameness (ETP), (C) at the onset of lameness (LAM), and (D) with Obel grade 3 lameness (OG3).

## Results

Only a few pRPS6 cells were seen in the baseline and ETP samples. pRPS6 positive cells increased with lameness and in the LAM samples were predominantly localized around vessel or distributed within the collagen matrix of the dermal lamellae. In the OB3, samples pRPS6 positive cell were predominantly localized to the basal keratinocytes within the epidermal lamellae. Positive correlations were noted between calprotectin and pRPS6 staining.

## Conclusions

Activation of the mTOR pathway occurs in sepsis-related laminitis, demonstrated by pRPS6 staining. Intensity of staining increases with lameness and is correlated with activation of leukocytes and stressed epithelium. Further evaluation is needed to determine if therapeutics directed to this pathway could have benefits in the treatment of equine laminitis.





## Racehorse Safety in Louisiana: 2009-2022

### Authors/Investigators

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### Introduction

Safety is the utmost concern of the Louisiana Racing Commission and to improve racehorse safety, the Fair Grounds Race Course (FGRC) in New Orleans, LA participates in the National Thoroughbred Racing Association Safety and Integrity Alliance (NTRA-SIA). All racehorse fatalities at the FGRC are reported and submitted for necropsy to determine the cause of death. The State of Louisiana established new medication rules in 2015 and participated in the alliance as of 2009, the goal was to lower the overall death rates of racehorses within the states. The purpose of this study was to report the incidence of fatalities in racehorses at the FGRC from 2009 to 2022 to then compare to the death rate at other Louisiana racetracks to assess the efficiency of the alliance.

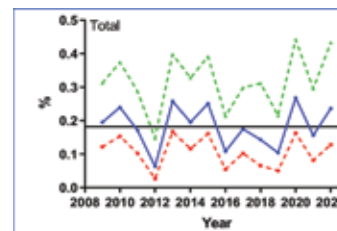


Fig. 1. Yearly and overall percentage of racehorse deaths per starters at the FGRC. The cumulative mean (0.18%) is noted by the black line. Dotted green and red lines encompass the 95% confidence interval.



## Hypothesis/Objectives

1. The death rate in Louisiana horse racing at the FGRC is lower than other racetracks within the state.
2. Fewer catastrophic injuries occurred in racehorse racing in Louisiana after 2015 when compared to horses racing in 2015 and before.
3. Death due to catastrophic injury occurs less often in 2-year-old racehorses as compared to 3 and >4-year-olds.
4. The death rate for the racetracks associated with NTRA-SIA is lower than those that are not.

## Experimental Methods

Records of number of races, starters, ages, and number of fatalities were obtained from the Louisiana Racing Commission data base for the FGRC, Evangeline Downs (EVD), Delta Downs (DED) and Louisiana Downs (LAD) from 2009-2022 to compare death rates at racetracks associated with the NTRA Safety and Integrity Alliance versus those not. Necropsy reports from the Louisiana Animal Disease Diagnostic Laboratory (LADDL) at LSU were evaluated on all horses that died or were euthanized at the FGRC.

Data analyses were performed in JMP 16.0.0 (SAS Institute, Cary, NC). 95% confidence interval of each counts was obtained via Score method and each group was compared using a Chi-squared test. Significance was set at 0.05.

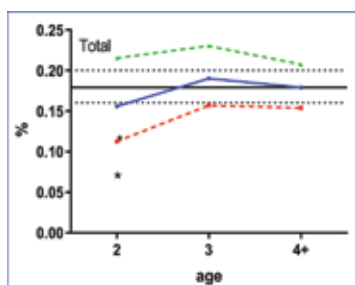


Fig. 2. Percentage of racing fatalities at FGRC based on age. The average (0.18%) is noted by the black line. Dotted green and red lines encompass the 95% confidence interval.

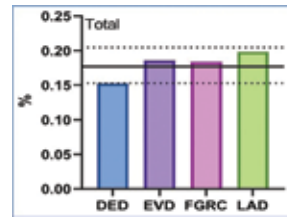


Fig. 3. A-D. Death rate for overall (A), 2-year-old (B), 3-year-old (C) and >4-year-old (D) at the Louisiana racetracks. Dotted black lines denote the 95% confidence interval of the mean. (DED=Delta Downs, EVD=Evangeline Downs, LAD=Louisiana Downs, FGRC=Fairgrounds Racecourse).

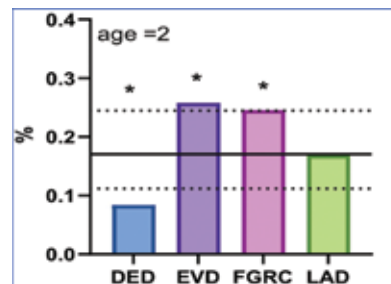


Fig. 4

## Results

The overall percentage of racehorse deaths per starters at the FGRC was 0.18% from 2009-2021 (Fig. 1).

At FGRC, the death rate for 2-year-old racehorses was significantly lower than the overall death rate of racehorses at the track ( $p=0.0018$ ) (Fig. 2). The overall death rate at LAD (0.22%) was significantly higher than the overall death rate among Louisiana racetracks (0.18%) ( $p=0.02$ ) (Fig. 3A).

The death rate for 2-year-olds at DED (0.06%) was significantly lower than at EVD (0.34%) and the overall (0.19%) (Fig. 3B). The death rate for 3-year-olds at EVD (0.04%) was significantly lower than all the other racetracks, as well as the overall death rate of 3-year-old horses ( $p<0.05$ ) (Fig. 3C). The death rate at the FGRC for >4-year-old racehorses (0.12%) was significantly lower when compared to the overall death rate at Louisiana racetracks (0.18%) ( $p=0.03$ ) (Fig. 3D).

## Conclusions/Clinical Relevance

Fewer fatalities occurred in 2-year-old Thoroughbred racehorses when compared to 3 and 4+ year old horses.

Racehorse deaths were highly variable but there was a 20% decrease in overall deaths from 2016 to present. There was no significant differences in racehorse deaths by year, other than in 2012 (Fig. 1).

The death rate for horses 4-years-old and greater was significantly lower at FGRC as compared to the overall death rate among racehorses in the State.

Fatality rates in racehorses were low in horses racing at the FGRC in Louisiana (0.18%) as compared to other racetracks under the safety alliance, such as Churchill Downs (2.24%) and Monmouth Park (1.36%).

Fewer 2-year-old racehorses died of catastrophic injuries over the years.

Racehorse safety has improved over the past 6 years, which is likely due to medication rule changes and safety certifications.

## Acknowledgements

Funded by Boehringer Ingelheim Animal Health Summer Scholars Program, Equine Health Studies Program and the Louisiana Animal Disease Diagnostic Laboratory.

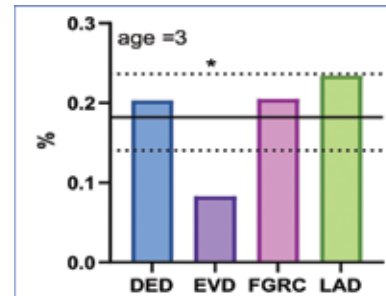


Fig. 5

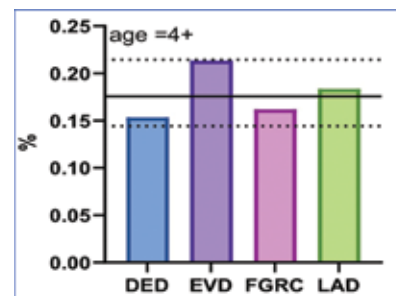


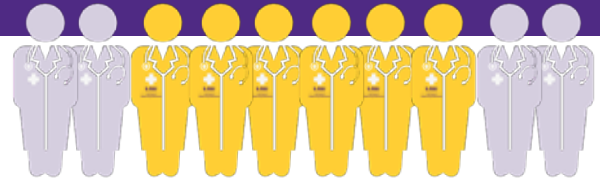
Fig. 6

**COMPREHENSIVE HORSE HEALTHCARE AND BIOMEDICAL RESEARCH**

# LSU EQUINE



A WORLDWIDE  
**LEADER**  
IN EQUINE  
HEALTH & RESEARCH  
PROTECTING LOUISIANA'S  
**\$2 BILLION**  
HORSE INDUSTRY



**LARGEST NUMBER OF BOARD-CERTIFIED  
EQUINE SPECIALISTS  
UNDER ONE ROOF IN LOUISIANA**

DELIVERING ELITE VETERINARY CARE & INSTRUCTION,  
DIAGNOSTIC & THERAPEUTIC TECHNOLOGIES,  
AND RESPONSE TO EQUINE DISEASE OUTBREAKS

**34,000+**



EQUINE CASES IN OUR  
VETERINARY TEACHING  
HOSPITAL SINCE 2003



**OVER 100**

ACTIVE RESEARCH GRANTS  
AND FUNDED PROPOSALS  
SINCE 2015

THERE ARE OVER

**164,000  
HORSES**  
IN LOUISIANA

**54,000+ PEOPLE**

IN LOUISIANA ARE INVOLVED IN THE HORSE  
INDUSTRY AS OWNERS, SERVICE PROVIDERS,  
EMPLOYEES, AND VOLUNTEERS

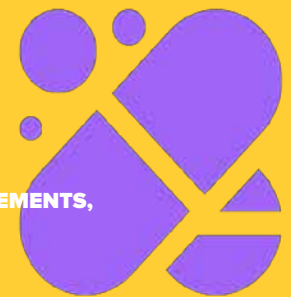


**30+**  
SERVICES

INCLUDING  
PRIMARY CARE,  
SPECIALTY SERVICES,  
SURGICAL SERVICES,  
SPORTS INJURIES,  
AND LAMENESS

**CLINICAL  
RESEARCH  
TRIALS**

THAT EVALUATE FEED SUPPLEMENTS,  
PHARMACEUTICAL AGENTS,  
AND CURES FOR DISEASE



# REAL IMPACT

ON THE LIVES, HEALTH, AND ECONOMY OF LOUISIANA

**\$3.5M+**

IN PRIVATE DONATIONS FOR  
EQUINE HEALTHCARE FUNDS,  
RESEARCH, AND SCHOLARSHIPS



# Is Buprenorphine Toxic to Equine Chondrocytes In Vitro?

## Introduction

It has been demonstrated that intra-articular opioid administration has the potential to alleviate pain post-operatively. The objective of this study was to assess the cytotoxic effect of buprenorphine exposure on healthy equine articular chondrocytes in vitro.

## Experimental Methods

Chondrocytes were isolated from articular cartilage of horses and cultured with the following treatments: high dose buprenorphine (HBUPRE; 0.12 mg/ml), low dose buprenorphine (LBUPRE; 0.05 mg/ml), morphine (MOR; 2.85 mg/ml), bupivacaine (2.2 mg/ml) and media (CON). Chondrocyte viability was assessed using live/dead staining, WST-8 cytotoxic assay, and lactate dehydrogenase assay. The percentage of live cells was determined and compared between treatment groups.

## Results

Significant increase in toxicity of chondrocyte occurred with high-dose buprenorphine and bupivacaine when compared to media, morphine, and low-dose buprenorphine (Figures 1 & 2).

## Conclusions and Future Studies

Although high concentration of buprenorphine demonstrated toxicity of chondrocytes in culture, the low dose of buprenorphine did not. Further evaluation of low-dose buprenorphine in joints is needed before recommending its clinical use.

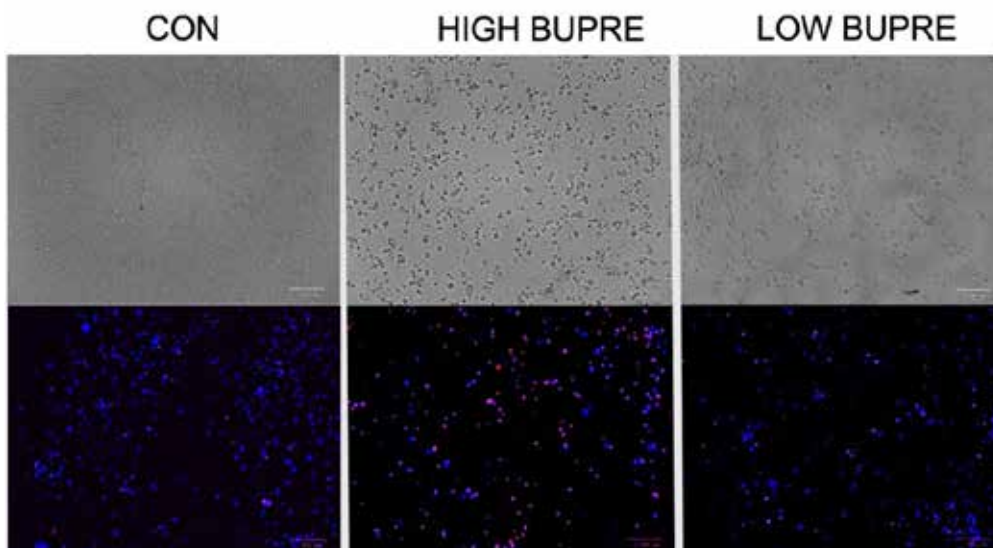


Figure 1: Phase (top) and fluorescence (bottom) microscopy images of chondrocytes after 2-hours of exposure to treatments (CON=media only; HBUPRE=high concentration of buprenorphine; LBUPRE=low concentration of buprenorphine). Pink cells are non-viable cells within the culture. Note the increased number of pink cells in the HBUPRE group.

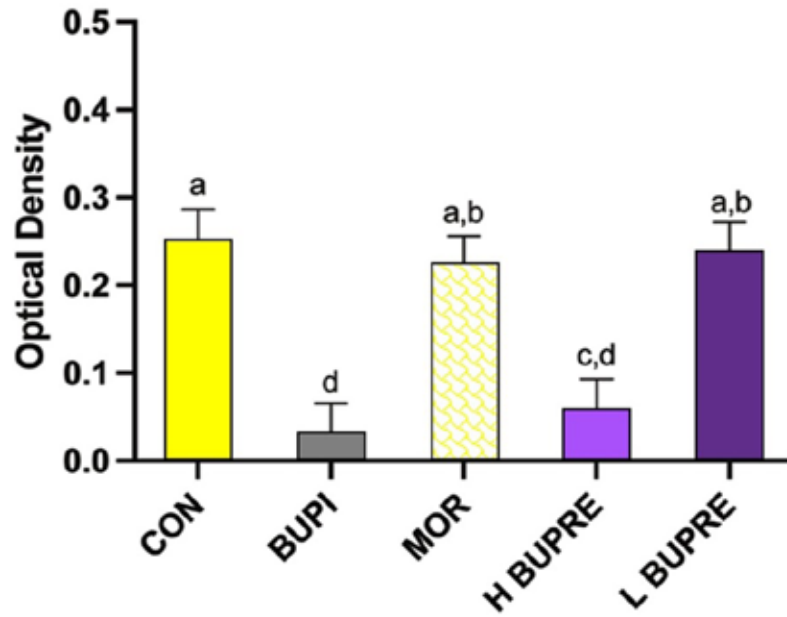


Figure 2: Chondrocyte viability determined by WST-8 assay to assess mitochondrial activity. Higher optical density represents greater mitochondrial activity and greater viability. Mean  $\pm$  SD optical densities (OD) from cultured equine chondrocytes following exposure for 2 hours. Different lowercase letters indicate significant differences ( $P \leq 0.0001$ ) between treatment groups.



# LSU Vet Med Equine Health and Sports Performance Center of Excellence

The LSU School of Veterinary Medicine is envisioning one of the most ambitious projects in its history: the LSU Vet Med Equine Health and Sports Performance Center of Excellence. This facility will be home to the preeminent equine healthcare and research facility in the region, combining superior clinical practice, expert translational research, and world-class teaching into one modern facility located directly on the LSU Vet Med campus and in the very heart of horse country in Louisiana.

The vision for this center is necessary for Louisiana. There are approximately 57 equine veterinarians in the state today. In 10 years, trends indicate there will be fewer than 40 equine veterinarians to service 120,000 horses throughout Louisiana. Fewer all-service clinics in the state will result, reflecting fewer clinical practitioners and the extremely high cost of equipment needed to provide advanced equine healthcare.



