

Equine Guelph

Health Studies



15th Anniversary Edition – Volume 15 – 2018

helping horses for life

Serving the Equine Industry for 15 years

“World-renowned for its educational and outreach programs, Equine Guelph (EG) serves an equally important role in providing funds for world-class research at the University of Guelph for the past 15 years,” says newly appointed Equine Guelph Research Committee co-chair Dr. Thomas Koch. In the past 15 years, EG has supported over 100 equine research projects!

Many common veterinary and husbandry practices are resultant of EG funded projects: bronchio-alveolar lavage (lung washes) to diagnose asthma and the use of inhalers to treat asthma; anesthesia is much safer today since we now know that low blood pressure during anesthesia is associated with muscle damage and poor recovery; we know nutrition and osteochondrosis are related and therefore we feed young horses differently today; Clostridium difficile bacteria can cause life-threatening diarrhea in horses, inflammation of the small intestine, as well as abscess formation following intramuscular injections, but treatment is often possible with selective use of antimicrobials. This is just a small list of how Equine Guelph-supported research has led to better equine care and welfare.



Dr. Jeff Thomason hands over the reins to Dr. Thomas Koch as research co-chair

Koch himself has seen his research advance, with the help of EG funding – Stem cells are now routinely used to treat horses with tendon and ligament injuries at the Ontario Veterinary College. “I am excited about my new role as this helps me to give back to the industry,” says Koch. “EG has been absolutely instrumental to the establishment of my research program in equine stem cells and regenerative medicine.”

On the prospect of continued equine research Koch is more tempered since EG research funding is not a given and currently there are very few dollars available for equine research. Historically, research funds have mostly come from the Ontario racing industry represented by the Standardbred, Thoroughbred and Quarter Horse organizations. The E.P. Taylor Foundation contributes additional funding. Recently, Ontario Equestrian has become an important partner as a provider of research funding.

Prof. Jeff Thomason’s ten year tenure as research chair has seen challenges facing the racing industry resulting in reduced support of equine research. Despite these formidable challenges, research funds have been available to support research. Thank you, Prof. Thomason for the hard work over the years to support, promote and celebrate equine research!

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Join us in celebrating the horse!

Through 2018 Equine Guelph celebrates 15 years of supporting horse health, welfare and safety – for all horses for life!

Equine Guelph will be contacting experts and leaders of the industry for their view of what we can do to improve equine welfare. We want you to join in and give us your thoughts on this important topic.

What is the one thing we can do to support Equine Welfare? Go to: goo.gl/Aep2tq



Serving the Equine Industry for 15 years

continued from page 1

Your donation is leveraged to create more. Changes in the Ontario racing industry emphasize the need for the industry to come together as a whole to support the development of new information from evidenced-based studies. Every donation counts and your donation can help leverage success!

The Equine Guelph Research Committee, consisting of industry representatives and equine faculty members, oversees the allocation of research funds, and is co-chaired by an industry and a faculty representative.

As the new faculty co-Chair of the committee as of December 1, 2017, Koch and many others are actively seeking to restore a sustainable research funding mechanism. "Many people are not aware of the large ripple effect generated by Equine Guelph research funds. That initial research dollar provided by EG allows researchers to apply for student stipends and gain access to research horses at a very reduced cost through the University of Guelph and OMAFRA partnership," Koch explains. As a research program gets established, the faculty member is able to compete for further funding outside of the University, which grows their research programs. The training of equine board-certified specialists also relies on these initial research funds. Sound public policy decision-making also relies on independent peer-reviewed research and access to independent experts. Reduced research funds are therefore about much more than simple loss of discoveries and the development of new diagnostic tools and treatment. This is why Koch is so determined to ensure that everyone is aware of the full cost of reduced research funding and conversely, "how much good we can do together starting with that initial research dollar to Equine Guelph".

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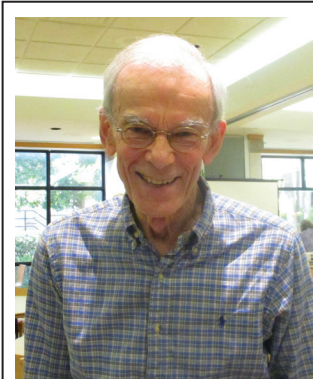
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Together We are Stronger – your donation dollars multiply

As a donor, you want to know your dollars are making a difference. With your help, Equine Guelph has provided funding for over 100 research projects, in the past 15 years, supporting groundbreaking work that is making a significant difference in the lives of our horses.

Go to Equine Guelph's research archives EquineGuelph.ca/research/index.php & research newsletters EquineGuelph.ca/news/newsletter.php

Internationally Acclaimed Contributions to Embryo Transfer and Reproduction Technologies



Dr. Keith Betteridge

Countless contributions to advanced embryo-technologies, including contributions to the description of the equine capsule have resulted in numerous international awards and accolades for Dr. Keith Betteridge. He is a global collaborator and world leader in his field, with over 100 published research papers contributing to the commercial use of embryo transfer (ET) in domestic species, especially cattle and

horses. Betteridge has been research chair of numerous committees in animal biotechnology and equine reproduction including the International Equine Reproduction Symposium committee - a meeting where he first spoke in 1974 when it was inaugural and embryonic itself! In 1986, he was appointed Research Chair in Animal Biotechnology at the Ontario Veterinary College, University of Guelph.

Recipient of the International Embryo Transfer Society (IETS) Pioneer Award in 2003 for his contribution to embryo transfer and advanced embryo technologies in domestic animals, Betteridge is known for more than his contributions to equine embryonic development. He is a pioneer in large animal embryo transfer and comparative embryonic development. Achievements include many firsts: the first transatlantic shipment of pig embryos, Canada's first ET calf in 1972, and the world's first sexed calf born in 1975 following the determination of its sex at the early embryo stage.

With students at a short course on ET, Betteridge presented in Maracay, Venezuela, in 1979. He transferred the embryo that produced that country's first ET calf.¹ The first (and, to date, only) genetically identical mammalian quadruplets produced by embryo manipulation (calves John, Paul, George and Ringo) were produced in Betteridge's laboratory in OVC by the late Dr. Naida Loskutoff and Dr. Walter Johnson in 1992.² Betteridge has been involved in ET since the dawn of equine ET in the early 1970's and has seen it evolve into an industry that is estimated to perform over 20,000 transfers annually and, in the process, has embraced two more advanced techniques: producing embryos in vitro by intracytoplasmic sperm injection (ICSI), and cloning horses by somatic cell nuclear transfer (SCNT).³

A large number of graduate students and post-doctoral fellows have benefitted from the experience, commitment and knowledge of Betteridge, not to mention a plethora of international scientists that have visited his laboratories.

A great teacher and also a passionate learner, Betteridge has worked with some of the best. From 1991 – 1996 he worked with the late Stanley Leibo, one of the world's best cryobiologists associated with embryo and gamete freezing. Leibo demonstrated that oocyte cryopreservation could be significantly improved by ultra-rapid cooling.

Retirement has not hindered the passion or quest for further knowledge as Betteridge continues to work on collaborative studies of early equine pregnancy with Drs. Jim Raeside, Tony Hayes and Brandon Lillie at the University of Guelph and Dr. Claudia Klein at the University of Calgary.

Betteridge understands well the value of long-term studies and is excited about the future directions of research on equine reproduction with the advent of new technologies such as Next Generation sequencing of RNA. "RNAseq gives us the ability to identify the which, when and where of genes that are active," says Betteridge.

With a bank of samples collected during experimentally induced and naturally occurring embryonic death, and with such new technologies, they have tools to gain insight into developmental origins of health and disease and potentially come up with diagnostic testing to evaluate the risk of pregnancy failure. Studies at Guelph are looking into: which tissues of the mare and her embryo are producing what proteins and other molecules (notably steroids), and in what quantities; which tissues are producing receptors for what proteins and other molecules, and how this regulates the response of one tissue to another; and how such proteins, other molecules, and interactions in the horse are similar to, or different from, those found in other species, including humans; which genes control the myriad molecules and their interactions, and when mares and their embryos are expressing those genes.⁴

The prospects for understanding the signaling pathways between the mare and the early embryo — essential to the maintenance of equine pregnancy and vital to health in later life — are brighter than ever with these rapidly evolving genomic and proteomic techniques.

Story by Jackie Bellamy-Zions

¹ K.J. Betteridge / Journal of Equine Veterinary Science 34 (2014) 10–11

² K.J. Betteridge / Therio-ontology: A personal view of 40 years of farm animal embryo form and function/<https://doi.org/10.1016/j.theriogenology.2013.09.014>

³ A journey through horse cloning, Andrés Gambini A B D and Marc Maserati C + Author Affiliations. Reproduction, Fertility and Development 30(1) 8-17 <https://doi.org/10.1071/RD17374> Published: 4 December 2017

⁴ K.J. Betteridge / What has research done for the horse breeder lately equineguelph.ca/research/betteridge.php#ResearchDone

TVEC Goes Global

A recent article from Cornell University showed veterinarians stopping a horse's heart from beating arrhythmically using a procedure called Transvenous Electrical Cardioversion (TVEC). The article brought a smile to the face of OVC's Dr. Peter Physick-Sheard, whose team developed the procedure just over a decade ago with Dr. Kim McGurrin, with the support of funding from Equine Guelph. The duo achieved 100% successful response rates treating the arrhythmia, allowing high performance horses to return to work.

Since that time over 300 horses (primarily racehorses) have had TVEC performed by the veterinarians at the University of Guelph. Worldwide, TVEC procedures are now being performed at 17 institutions and 3 private practices, within 9 countries and 4 continents.

'Fluttering,' or atrial fibrillation (AF) occurs when the normal rhythmic contractions in the top portion of the heart are replaced by rapid, irregular twitching, causing the atria – two of the heart's four chambers – to quiver, or fibrillate. This quivering upsets the rhythm between the atria and lower chambers of the heart, interrupting their regular beat. AF can mean the end of a horse's racing career with signs including poor performance and sudden deceleration during a race.

During the TVEC procedure, electrodes are placed into the heart to deliver an electric shock, while the horse is under anesthesia, to convert the rhythm back to normal. McGurrin and Physick-Sheard developed the now widely available and often preferred, method for conversion of AF in horses. Dr. Physick-Sheard explains the reason they first looked into the possibilities of TVEC was to create a procedure with the ability to treat AF without use of drugs and the unavoidable side effects of sickness that can go along with them. With TVEC they can also treat horses that could not be treated with drugs. Physick-Sheard says, "There are horses that cannot tolerate the drug due to hypersensitivity, and others that would require such a high dose they could become dangerously ill, and still others that simply do not respond." With TVEC no drug treatment is required and the horses can return to work without suffering through any sickness caused by

the administration of the drugs typically used to treat AF. There are several new drugs on the market to treat AF and some are effective, but they all have the potential to cause arrhythmias themselves.

The longer a horse has had AF, the less likely drug therapy is to be effective, but this is not the case with TVEC. "The bigger a horse, the older a horse and the longer it has had the problem, the less likely they are to respond to traditional drug therapies," says Physick-Sheard. Physick-Sheard explains that unlike humans, a horse with this arrhythmia usually has essentially normal cardiac health otherwise. Humans with AF are most often seniors and/or suffer from heart disease, and affected persons are predisposed to strokes. A horse with AF does not usually have these significant clinical complications, they do not have strokes and usually do not have any other associated cardiac problems. Physick-Sheard explains, "The motivation to treat a horse with AF is to increase their value or to get them back to the races or high performance work."

Physick-Sheard goes on to say that nothing is perfect and 20% of horses treated with TVEC are likely to relapse. They have treated some horses 3 – 4 times. It is a procedure requiring general anesthesia and special training. "Correct electrode placement is critical," says Physick-Sheard, "and at the OVCHSC we use multiple modalities to ensure this, including measurement of electrode depth, ultrasound, pressure guidance and finally an X-ray once the horse is under anesthesia. No other drugs are used in the procedure at OVC, it is straight technique." Dr. McGurrin has travelled extensively to clinics adopting TVEC to teach and train veterinarians in these important steps to follow both for safety and effectiveness of the procedure.

Other facilities practicing TVEC include: Cornell University, New Bolton Centre - Pennsylvania, University of Florida, University of Georgia and University of California at UC Davis Veterinary Hospital.

"It would not have been possible to carry out this

Health Studies with an Impact – Reducing Catastrophic Racing Injuries

The entire racing industry wins when the incidence of catastrophic injuries are reduced. Dr. Jeff Thomason is a researcher at the Ontario Veterinary College who has had an impact, from contributing to the international publication of the Racing Surfaces ‘White Paper’ in 2011 to several more recent projects collecting considerable data on hoof loading across multiple disciplines. With much of the ground work completed, Thomason envisions within the next decade ways to reduce catastrophic injuries will be enabled by a complex computer program comparing decades worth of big data sets collected from hoof sensors in action. The software will be capable of differentiating aspects of loading and what effects that loading.

Thomason has been working on measuring joint loading since 1985 when he put his first strain gauge on a hoof. Perseverance and foresight is paying off as the picture is becoming clearer on how all the data is going to come together and be of practical value.

In 1998 data collected, with graduate student Heather McClinchey, showed the hoof sensors are sensitive enough to distinguish the differences in loading between the sitting and rising trot.

By looking at the measurements of data that are consistently different, Thomason aims to have software that can identify: breed, gait (even what lead the horse is on in canter), surface, and numerous other specific variables.

Thomason and his team have collected data from different breeds doing different activities – Thoroughbreds, Standardbreds, Quarter horses and Grand Prix jumpers to name a few. “No one has the same spread of data we have from multiple disciplines and



OVC is unique in its approach,” says Thomason, “firstly, in the type of data collected providing direct information on hoof loading and second, in the questions we are asking of this data.”

When the team attaches hoof sensors, over 30 measurements are being taken per footfall; all to do with shock and loading and timing thereof. If the data will identify which of the many measurements can distinguish what surface a horse is on; they will then be able to ask what they are doing to the loading of the leg. For example, it may turn out that the impact measurements have nothing to do with it but the sliding measurements or maximum load measurements do.

Thomason continues to collect data on impact in his current study with graduate student Danielle Halucha. They are comparing loading between the forelimbs of racing Thoroughbreds to investigate possible causes of laterality in catastrophic injury.

Thomason collaborates regularly with world leader and executive director of the Racing Surfaces Testing Laboratory, Mick Peterson and his group in the U.S. and colleagues in Europe.

With each study and each collaboration, Thomason sees the potential of the data. “Lameness or injuries of mechanical cause in any kind of elite athlete, we should, within ten years, be able to pinpoint causes and therefore do something about them,” says Thomason. What is going to go back to the industry is some concrete practical advice on some things that can be tried by the industry with the aim of reducing injuries.

Funding for this research has been provided by Equine Guelph, NSERC, OMAFRA and a donation from Footings First.

Story by Jackie Bellamy-Zions

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More Updates on Health Studies

Teaming up to Go with the Gut

Drs. Luis Arroyo and Emma Allen-Vercoe look at the links between the gut microbiome and health.

<http://www.equineguelph.ca/news/index.php?content=542>

Research targets equine virus

Searching for clues to better manage a virus that can cause late gestation abortion in mares.

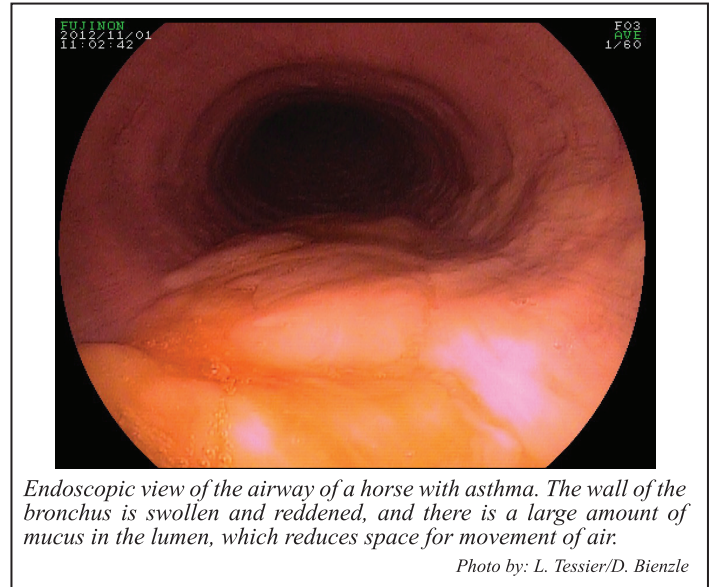
<http://www.equineguelph.ca/news/index.php?content=541>

Project Update - Global Lung Epithelial Response to Inhaled Dust

Using a technology pioneered at the Ontario Veterinary College, immunohistochemistry, Dr. Dorothee Bienzle and her team have been putting antibodies against lung proteins on biopsy slides to confirm changes in genes when the lung epithelium becomes inflamed, as is the case with horses suffering from heaves. These antibodies created at the University of Guelph have been shared with fellow researchers as far afield as Belgium, Austria and the United States.

After repeated exposure to dust and mould, the epithelial cells start to lose their specialized functions and production of certain proteins is impacted. Recently they have discovered the circadian clock is altered. “The epithelium is working overtime to heal during dark hours,” says Bienzle. The cilia that normally beat in coordination to move mucus up and out appear abnormal. In identifying the role of proteins they are studying, Bienzle explains that this will help researchers to better understand how the airway defends itself against environmental stimuli, enabling them to properly diagnose and better treat performance-crippling equine asthma.

Findings from the latest research of doctoral student Laurence Tessier conclude that several differentially expressed genes and networks in horses with asthma are also important in human asthma, highlighting similarities between severe human adult and equine asthma. Neutrophil activation by the bronchial epithelium is suggested as the trigger of the inflammatory cascade in equine asthma, followed by epithelial injury and impaired repair and differentiation.



Endoscopic view of the airway of a horse with asthma. The wall of the bronchus is swollen and reddened, and there is a large amount of mucus in the lumen, which reduces space for movement of air.

Photo by: L. Tessier/D. Bienzle

For more, follow the Sept 2017 publication link
 (<https://www.ncbi.nlm.nih.gov/pubmed/28886691>)

Funding to date for this research has been provided by Equine Guelph, Canada Research Chairs (CRC) program, Natural Sciences and Engineering Research Council of Canada (NSERC) and Ontario Ministry of Agriculture and Rural Affairs. An Ontario Veterinary College fellowship was awarded to Laurence Tessier.

Story by Jackie Bellamy-Zions

EquiMania! is Hopping and Happening!



Photo by: Jackie Bellamy Zions

Kids were encouraged to ‘Stop, Think and Act’ as they navigated a hopscotch game teaching good choices when it comes to safety around the horse farm - a new campaign launched at the 2017 Royal Agricultural Winter Fair.

While engrossed in the well-travelled, award-winning display, kids and parents learned more about horses and safety inside the stable and out, around equipment and when handling them. “The fun does not end here,” says Equine Guelph director, Gayle Ecker, “EquiMania! is now online at TheHorsePortal.ca! Equine Guelph is all about continuing education; from youth to adults, programs are designed for horse enthusiasts and future professionals.”

Equine Guelph would like to thank all the 2017 venues for bringing EquiMania! to their Education Centres and our sponsors for their continued support: Esso, Greenhawk, Kubota Canada, Ontario Equestrian, Shur-Gain, Standardbred Canada, SSG Gloves, System Fencing and Workplace Safety and Prevention Services. Equine Guelph is looking forward to another busy year of touring with EquiMania! in 2018!

To book EquiMania!
 contact eq4kids@uoguelph.ca

Visit EquiMania!
 (EquiMania.ca)

Equine Guelph healthcare tools are a perfect fit!

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Senior Horse Challenge

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EVENTS

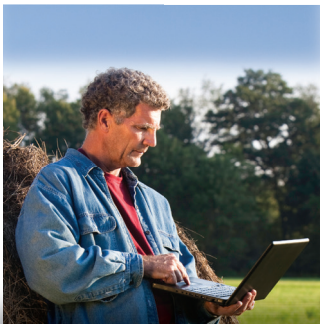
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Can Am All Breed Equine Expo
(Markham) - EquiMania!
April 6 - 8

Equine Guelph's 12 week Online Courses
(Next offering May 2018)

Visit EquineGuelph.ca and TheHorsePortal.ca
for more course information.

Anyone wishing to excerpt Equine Guelph should contact: Jackie Bellamy-Zions ext 54756 jbellamy@uoguelph.ca



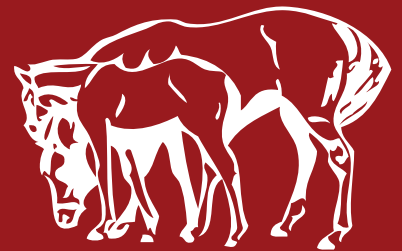
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