



Equine Guelph

Research Update

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Using imaging modalities for early detection of muscle abnormalities

It hasn't been possible to detect muscle abnormalities in horses' upper airways early before the muscles completely degenerated.

Now, a University of Guelph equine researcher who's been using ultrasound technology to diagnose upper-airway diseases, is trying to determine if imaging modalities such as ultrasound (along with MRI and CT scans) will help her spot abnormalities - such as muscle atrophy - early to prevent degeneration.

Prof. Heather Chalmers, Department of Clinical Studies, is looking at using ultrasound to identify muscle abnormalities that lead to degeneration. She and her fellow researchers already know muscle abnormalities appear under a microscope from biopsy samples, but now they want to establish how they appear using ultrasound, CT scans and MRIs.

They're also exploring the imaging modalities' potential diagnostic applications to determine what stage of muscle degeneration can be detected with ultrasound. This would allow them to screen horses to pick up on muscle abnormalities in their earlier stages.

"With this technology, we could then advise potential buyers, or institute care proactively to limit the disease's impact," says Chalmers.

If the imaging modalities prove to be successful at detecting muscle degeneration early, they could be used to combat an upper-airway disease called laryngeal hemiplegia, or "roaring," which affects eight to 10 per cent of performance horses.

The disease affects a cartilage flap that the muscle is supposed to move for air to flow into the windpipe. But when laryngeal muscles lose nerve connection, they become paralyzed and the cartilage won't move. Horses afflicted with the disease make a whistling or roaring sound when breathing.



Their air intake is also reduced, which limits athletic performance.

"We're also interested in using ultrasound to assess the effectiveness of therapies to treat roaring," says Chalmers.

Others involved in this research are Profs. Laurent Viel, Judith Koenig, Jeff Wilson and Jeff Caswell of the University of Guelph, as well as Prof. Norm Ducharme from Cornell University and Prof Richard Piercy from the Royal Veterinary College in the U.K.

Funding for Chalmers' research is provided by Equine Guelph and Med El.

- Joey Sabljic

"You will notice a new look to this issue of the Newsletter. Last Fall, a very successful issue of the University of Guelph's Research Magazine focused on the equine research group. This year, we are using this expanded issue of the Newsletter to convey the same message. As well as showcasing some of our researchers and their work, there is a longer article on research projects that were stimulated by the establishment of the racing Death Registry by the Ontario Racing Commission. The knowledge gained throws a very positive light on the otherwise disheartening fact of racing fatalities."

Dr. Jeff Thomason, Co- Chair, Equine Research Committee



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Keeping a racehorse's career on track

The pounding of a horse's hooves on the racetrack is exhilarating for spectators...but not for the equine athletes. The action can indicate wear-and-tear injuries, and ultimately, shorten a horse's racing career. Researchers from the universities of Guelph and Maine are investigating hoof resilience, and how the track itself could be contributing to injuries.

Prof. Jeff Thomason, Biomedical Sciences, is observing how track surfaces affect harness racing horses, specifically. Although harness racing speeds aren't as fast as flat running, the damage it causes can be severe.

"Preliminary studies have shown that the impact forces on the hooves are four to five times greater than flat racing," says Thomason. "I suspect that this is a probable cause of injury we could prevent by redesigning the track surface."

Currently, tracks for harness racing are made of crushed stone, and are much harder than turf tracks used for flat races. The hard surface and banked turns ensure the cart moves at maximum speed. But these features can come at the expense of the horse's hooves.

In cooperation with Mohawk raceway, Thomason attached lightweight sensors to the hooves of 10 standardbred racehorses to measure the impact and strain on their hooves at training speed on one straight and one curve of the track. Their drivers activated the sensors when they reached peak speed.



Jeff Thomason is observing standardbred racehorses, such as these, to measure the impact and strain the race track may have on their hooves.

Then, Dr. Michael Peterson, a track surface specialist from Maine, tested the same stretch of track with a device that records the shock of a dead weight at its point of impact. After comparing these mechanical data to that from the live horses, the researchers will be able to more clearly understand the hoof-track interaction.

"The ultimate question is, by changing the track, how much can you reduce the impact

on the feet?" says Thomason. "If we make the changes that are kinder to the limbs of racing horses, then they could race longer."

Funding for this research was provided by the Ontario Racing Commission's Horse Improvement Program.

- Natalie Osborne

Less wait time for an MRI



Hoof pain can be pinpointed by using local anaesthetic injections.

Efforts are underway to decrease the amount of waiting time needed to determine if a lame horse needs magnetic resonance imaging (MRI). These MRIs help discover sources of pain associated with lameness, so reducing the wait will decrease the time a troubled horse is in pain.

Since 2005, Prof. Nicola Cribb and her colleagues of the Department of Clinical Studies at the University of Guelph have used MRIs on more than 250 horses, citing it as the best standard of diagnostic imaging.

They need top technology, because detecting the precise source of pain plaguing a horse is a tough challenge. Humans can identify specific problems or pain within a joint, ligament, or tendon. But such information is hard to come by when dealing with a horse. Current technology can't help a great deal --

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Embryo transfer made easier



Photo by Martin Schwalbe

Tracey Chenier is examining freezing chemicals that could make frozen embryo transfer more effective.

The frozen embryo transfer business is booming in the cattle industry, and Prof. Tracey Chenier from the Department of Population Medicine thinks that might be related to the relationship between the freezing chemical, called the cryoprotectant, and the embryo.

Chenier says embryo transfer is under-utilized with horses because embryo freezing has been mostly ineffective, and fresh embryo transfer is costly and inconvenient.

She's found that the glycoprotein-based capsule surrounding a horse's embryo prevents the freezing chemical from entering the tissue. The success rate of freezing the embryo also drops from 50 per cent to less than 10 per cent once the capsule forms about seven days after ovulation.

Her new research study will examine two specific cryoprotectants - glycerol and ethylene glycol - to determine how to freeze the embryo despite the capsule's impermeability.

"We need to either find a different way to get the cryoprotectants in, or we need to work with different chemicals," says Chenier. "But first we need to know whether these cryoprotectants cross the capsule and if not, which ones might."

The freezing chemical prevents large, damaging ice crystals from forming, while still freezing the cell. It's a delicate balance to find the highest concentration of cryoprotectant without the chemical itself damaging the cell.

In her study, Chenier will be using gas chromatography, an analysis technique that allows researchers to detect tiny amounts of material within the embryonic tissue and fluid. She'll examine 12 embryos to see how efficient the selected freezing chemicals and techniques are.

The study begins this September at the University of Guelph and the Arkell Research Station.

"There are many different reasons you might use embryo transfer more, if you could freeze the embryos," says Chenier. "You can market embryos for export, you can put them into the recipient when it's more convenient for you."

The bottom line is successfully freezing horse embryos will make embryo transfer much less expensive for horse owners.

Chenier is working with DVSc students Tracy Plough and Adria Kukk, as well as Prof. Marcel Schlaff in the Department of Chemistry at the University of Guelph.

Her study is funded by Equine Guelph with in-kind donations from Partner Animal Health.

- Katelyn Peer

Working towards less waiting time for an MRI (continued from page 2)

the tissue in a horse's foot is dense from the surrounding hoof wall, making it hard to obtain a clear ultrasound and diagnose a problem.

The researchers have worked around the situation by selectively desensitizing different areas in the horse's foot with local anesthetic injections. These injections allow care-takers to identify the specific area where a horse is experiencing pain. Then, a decision is made about whether to move onto an MRI.

Cribb's overall goal is to develop a protocol that will tell horse owners how long they need to wait between administering diagnostic injections of local anesthetics into a horse's foot, and performing an MRI.

"We're trying to scientifically determine how long it takes for any reaction from the anesthetic to go away, in order to distinguish the real causes of lameness," she says. "Ultimately, we're trying to decrease the waiting time before doing an MRI to eliminate any unnecessary pain for the horse."

Her research is being funded by Equine Guelph.

- Johnny Roberts



Good coming from bad – research on racing fatalities

Did they have to die? Maybe not.

That's what the Ontario Racing Commission (ORC) hoped to find out when it set up its Death Registry to document untimely deaths of racehorses in Ontario. "We've always lived with a certain number of breakdowns," says Dr. Bruce Duncan, who manages the project for the ORC. "It's one of the unfortunate things that happens." He says that the Registry tracks fatal breakdowns, by requiring that any Standardbred, Thoroughbred or Quarter horse that dies within 60 days of a race must be reported to the ORC. This mandatory registration seeks to hold the racing industry publicly accountable for the best possible care of the horse.

At the instigation of Duncan and Dr. Laurent Viel of the Ontario Veterinary College and Equine Guelph, the mandate of the registry was expanded six years ago into the Death Registry Program (DRP), in which post mortems and follow-up studies were conducted on many of the deceased horses.

The DRP has provided a wealth of valuable data that has allowed researchers at Guelph to study issues such as catastrophic bone injuries, heart arrhythmias or cardiovascular abnormalities that may lead to what's known as "wastage" - the emotional and economic loss of a racehorse.

"The bottom line is to prevent injuries," says Dr. Antonio Cruz, a veterinary researcher who's been quantifying and characterizing catastrophic joint injuries from the vast amount of information that's been made available through the DRP. So far, he's documented and photographed over 1,700 joints from up to 880 animals between 2003 and 2008.

"The first job is to identify the problem," says Cruz, which from a joint injury perspective appears to be bone weaknesses. This was highly prevalent in the cannon bone and fetlock areas. He and his research team are trying to determine if the lesions were already present in young animals or if they

were caused by wear and tear. By characterizing the microstructure of the bones and relating that structure to bone strength, the research team has been developing a hypothesis for why those fractures may occur.

Cruz's research has become more than just strictly an observational study. Along with Dr. Mark Hurtig, a University of Guelph orthopaedic veterinarian, and a team of graduate students, the researchers are developing a "bench-top to stall-side" monitoring program that integrates everything they've learned in the lab into practical applications at racetracks or training facilities.

They want to demonstrate the correlations between quantitative ultrasound and blood biomarkers that may provide potential predictors for injuries as a method of finding horses that have occult injuries, as well as monitoring their progress and rehabilitation.

For Hurtig, the collaboration with the DRP converged with his strong interest in musculoskeletal injuries and osteoarthritis in racehorses and humans. They're one of only four groups in the world looking into the validation of quantitative ultrasound as a predictor of catastrophic injury. The breakdown registry data has been invaluable for their research.

Dr. Peter Physick-Sheard, a cardiovascular researcher at the Ontario Veterinary College, has been conducting research in horse performance for over 40 years that ties in with the DRP, generating what he calls, "all sorts of potentially useful information."

Besides the concept that the DRP forms an important part of the racing industry's social responsibility, Physick-Sheard is excited that the amount of raw research data gained from may stimulate the "one per cent eureka" moments in research which add value far beyond just using race horses responsibly. As he points out, regulatory issues can be



addressed using these data, and to ensure that we're using animals appropriately we need to identify, assess and respond to issues as they arise.

Physick-Sheard's recent work with live racehorses has involved attaching heart rate monitors to over 340 Standardbreds to measure their heart rate and rhythm before, during and after a race. So far the results are showing that between five to seven per cent of horses have shown significant transient rhythm disturbances yet appear perfectly normal and go on to race again without apparent problems.

The question being asked is, is a rhythm disturbance normal or is the horse getting into trouble? Information from the DRP may provide evidence that if such heart arrhythmias can be considered abnormal, there may be a cluster of deaths occurring at the stage of racing that are consistent with the rhythm disturbances.



“We’re beyond the cutting edge of science right now,” says Physick-Sheard, whose work has been attracting interest from human researchers as well. At present, there’s no equivalent data on any species - not even humans. “There’s tremendous potential here to provide guidance into why we see sudden deaths in humans in competition,” says Physick-Sheard. At this point he doesn’t know if the DRP will provide the answers – it may need to be broadened in some way.

As with most research, each question raises ten more. Do racehorses with underlying cardiac rhythm disturbances die from ruptured pulmonary arteries and hemorrhage?

Dr. Luis Arroyo is an Assistant Professor in the Department of Clinical Studies at the Ontario Veterinary College. His work as a graduate student under the supervision of Dr. Laurent Viel, one of the initial proponents of the DRP, is showing that vascular pathologies - arterial calcification in particular - are

surprisingly common in young racehorses.

Along with Dr. John Runciman, Associate Professor in the University of Guelph’s School of Engineering, they’ve used pulmonary arteries from the post-mortems to construct a computer model that will allow them to test the biomechanical properties of the blood vessels - particularly surrounding calcified areas - and the response of these vessels to pressure.

Results of their investigation have already generated an interest in investigating this pathology in other countries. Arroyo says, “There’s a great interest locally and internationally to find out why this type of vascular pathology occurs; what are the risk factors associated with it, and most importantly in my opinion, what’s the clinical relevance of such lesions?”

“We’re really just getting started on this,” says Runciman.

With these and future potential research studies, it’s safe to say that the DRP has met and exceeded its original mandate, and is unique among comparable programs worldwide. By providing significant numbers of systematic post-mortems, the DRP is a tremendous resource that provides consistent data to investigate problems relevant to horse racing that may not even appear in the general horse population.

- Karen Dallimore

Equine Guelph Honours the Memory of Horses



Equine Guelph understands what it’s like to suffer the loss of a beloved friend. The new Hoofprints memorial program gives grieving horse owners a positive means to cope with the devastating loss and a loving way to honour the memory of a horse.

Equine Guelph invites you to pay tribute to your horse by sending a photo and message of remembrance. We want to remember the legacy of all cherished horses, and share the story of their lives with other horse lovers.

Please go to www.EquineGuelph.ca/supporters/hoofprints for more information on our Hoofprints program.



Shockwaves

Using shockwaves for tissue regeneration

Shockwaves (modified sound waves) are currently used to treat tendon injuries in horses. Researchers at the University of Guelph want to know if shockwaves could do more for horse health and soft tissue injuries.

Prof. Judith Koenig in the Department of Clinical Studies says tendon injuries and certain distal limb wounds take a long time to heal. She's trying to determine if modified shockwaves could help veterinarians improve current treatment methods being used and speed up the healing process.

One current treatment method utilizes stem cells that are injected into tendon lesions to improve the quality of the healing tendon tissue. Shock waves may speed up the transformation of stem cells to fibroblasts, which are cells that produce the body's structural molecules within tendons.

"We're looking at shockwaves to determine what they do on a cellular level," says Koenig. "We want to look at the effect they have on both wound and tendon healing".

Electrohydraulic shockwaves are generated by a little spark which creates a rippling sound wave in water. When this wave meets up with the horse's skin or tendon, it creates small bubbles known as cavitation within the tissue.

When these bubbles burst, they create little jet streams that act on the cell and change the way they behave.

But research is still needed to better understand the mechanism by which shockwaves work.

"We're trying to improve the quality of repair to quickly return these equine athletes to their intended use," says Koenig.

Others working on this study are postdoctoral fellow Dr. Thomas Koch and Prof. Jon LaMarre from the Department of Biomedical Science at the University of Guelph, and a human research group lead by Dr. Wolfgang Schaden from a trauma centre located in Vienna, Austria.

Funding for this project has been provided by Equine Guelph.

- Anupriya Dewan



Judith Koenig, Melissa Sinclair and Alexander Valverde are investigating the benefits of using systemic lidocaine for field surgeries.

Using systemic lidocaine in the field

Field surgeries, such as castrations, are common in the equine industry. But according to Prof. Melissa Sinclair, Department of Clinical Studies, conventional anaesthetic and analgesic regimes using single doses of xylazine (an alpha2-agonist) and ketamine on their own in the field only allow about 10 -15 minutes for practitioners to complete their surgery.

Some field surgeries take longer and more time is needed. So practitioners often have to give additional doses of anaesthetic drugs intermittently throughout the surgical procedure to extend surgery time, which can be quite inconvenient.

Sinclair's new research study will investigate different combinations of standard field anaesthetic and analgesic regimes as well as include the systemic use of lidocaine in equine field surgeries to identify the ideal options.

"The alpha2s and ketamine have become the mainstay for what practitioners are using for field anaesthesia, but it's still tough to say what the best field anaesthetic combinations are," says Sinclair.

Some practitioners administer butorphanol, an opioid analgesic, and others may not. Intra-testicular lidocaine is also commonly used. However, it's not known if either improve analgesia or prolong surgical time. Sinclair says systemic lidocaine use in the field could reduce the need for additional injectable field anaesthetic drugs for private practitioners.

Systemic lidocaine is used in the hospital referral setting to reduce inhalant levels during general anaesthesia, but further research is needed to prove the same benefit of reducing the need for additional doses of xylazine and ketamine during field anaesthesia.

"Lidocaine is easy for practitioners to administer so there's not this situation where they're doing surgery, taking a break to give more field anaesthetic drugs to the horse, and then going back and doing more surgery," says Sinclair. "It smoothes out the whole surgical process."

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Towards more solid diagnoses



Photo by Martin Schwalbe

Graduate student Collette Elmas is using real time polymerase chain reactions (PCR) to promptly detect bacterial infections in a horse's joints.

Bacterial infections in a horse's joints can be fatal if not treated promptly. To more rapidly diagnose joint infections, researchers at the University of Guelph are developing ways to decrease the time -- and increase the accuracy -- for diagnoses.

Prof. Scott Weese, Department of Pathobiology, and his graduate student Dr. Colette Elmas are using real time polymerase chain reactions (PCR) to more quickly and accurately detect bacterial DNA in samples from septic joints.

They say this new rapid and accurate technique could especially benefit high-level competitive horses.

"Many horses are athletes and joint damage can hinder or end their career," says Weese. "Even a slight decrease in performance from joint problems can make all the difference between a high-level competitive horse and an animal that's unable to compete."

Horses can contract bacteria into their joints directly from a cut, a kick, complications from injections into the joint or any condition that allows bacteria to circulate through the blood stream and into a joint.

Weese and Elmas will be taking fluid samples from horses with suspected septic joints, then analyzing the samples for infectious agents. They'll use a traditional bacterial culture method along with their real time PCR method to compare results.

One major difference between these methods is that a culture takes a few days or more, while real time PCR takes only a few hours.

"Ideally we want to be able to say 'yes we have an infection' on the same day that the horse comes into the clinic," says Weese. "We would also like to be able to say what type of infection or bacteria it is, so we can provide a more direct and accurate treatment. This may allow for earlier treatment in cases of septic arthritis, less frequently treating horses with non-infectious diseases and hopefully better outcomes."

Funding for the project is provided by Equine Guelph.

- Carol Moore

Using systemic lidocaine in the field (continued from page 6)

Sinclair will be measuring the blood concentration of lidocaine during different field anaesthetic regimes with either systemic lidocaine or intra-testicular lidocaine groups or both during and after castration surgery. This in combination with the time and ease of the horse to stand or recover from anaesthesia will provide information required to assess systemic lidocaine use in the field.

With the help of Profs. Alex Valverde and Judith Koenig, Department of Clinical Studies, Sinclair will be performing nearly 50 field castrations over the next year on colts aged six to 12 months to investigate the benefits of using systemic lidocaine for field surgeries. In a preliminary study, the researchers found that treating horses with lidocaine didn't impact the quality of their recovery when used to extend field surgery times.

The study will begin this fall and is expected to conclude in two years.

Funding for this study has been provided by Equine Guelph.

- Andra Zommers

Check out our new look – and –
More resource tools for horse owners @
www.EquineGuelph.ca

Get a Free Customized Vaccination Schedule for Your Horse

Equine Guelph's new Vaccination Equi-Planner, sponsored by Intervet/Schering-Plough, is an online tool designed for horse owners to generate personalized immunization schedules for their horses.

Horse owners are asked to complete six questions that help us determine individual farm differences and risk factors, including: age, use, sex, exposure to outside horses and geography. This data is then compiled in a program, and a printable customized vaccination schedule is provided.

"Vaccines are an important part of a horse's preventative health program," says Dr. Richard Conrad, Technical Services Consultant for Intervet/Schering-Plough. "This new tool is a great starting point for horse owners and veterinarians to discuss the appropriate use of vaccines for their horses."

To access the Vaccination Equi-Planner, go to www.EquineGuelph.ca/Education/EquiPlanner



Equine Guelph thanks Intervet/Schering-Plough for supporting our education program.

EVENTS

Mark your calendar!

October 24 – 25, 2009

Equine Reproduction Workshop (tentative)

November 27 – 29, 2009

Ontario Equestrian Federation's Annual Conference

November 6 – 15, 2009

EquiMania! at the Royal Agricultural Winter Fair

January 11 – May 4, 2010

Equine Online Winter Course Offerings



Youth Safety Initiative Grows

This year, EquiMania!'s "Play Safe. It's HorseSense!" has expanded to include safety on the entire horse farm: in the barn, around equipment (RTV), outside, as well as, horse and rider safety. The multi-faceted safety initiative includes a scavenger hunt in which kids will be Danger Detectives investigating 12 safety hazards.



From 1990 to 2005, 63% of animal-related injuries among youth in Ontario occurred in incidents involving horses. The majority of the injuries were caused by falling from a horse or being struck by a horse. Machine run-overs were the predominant cause of fatal injuries – at 46% – for children under the age of 16.

"This is a partnership that makes sense," says Dean Anderson, executive director of the Farm Safety Association. "We can deliver a critical safety message in a fun, interactive way to kids through EquiMania!'s high-profile educational initiatives at equine events."

Equine Guelph welcomes the Ontario Equestrian Federation as a new partner of "Play Safe. It's HorseSense."

Equine Guelph

Equine Guelph is the horse owners' and caregivers' Centre at the University of Guelph dedicated to improving the health and well-being of horses through research, education and performance.

We need your help. To donate, please contact 1.888.266.3108 or visit www.EquineGuelph.ca and click on "Supporters".

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FARM SAFETY ASSOCIATION
Growing Safety

