

RESEARCH



From start to finish

At the University of Guelph, researchers are maximizing equine health and welfare in new ways

Equine is a \$19-billion industry in Canada, making the health and welfare of horses a vital pursuit.

Equine Guelph and the Campbell Centre for the Study of Animal Welfare have developed strong partnerships with the University of Guelph's Ontario Veterinary College (OVC).

Researchers and educators work together to improve the lives of all horses, and of the equine industry as a whole.

The University of Guelph was the first institution to establish an animal care policy for animals used for research and teaching. Together with OVC, Equine Guelph, and the Campbell Centre for the Study of

Animal Welfare, the University strives to uphold and exceed high standards for the welfare of horses.

Researchers are increasingly adapting new technology for use with horses as it becomes more advanced and accessible. The focus has shifted to maximizing equine health and welfare, while simultaneously minimizing challenges that accompany domestication.

But overall, the goal never changes: provide the best in equine animal health and welfare, from start to finish.



Mare-and-embryo communication in pregnancy loss

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PETER PHYSICK-SHEARD

Cardiac arrhythmia and death registry

The high sudden death rates of racehorses have led researcher Dr. Peter Physick-Sheard of the OVC to study cardiac arrhythmia—serious disturbances in cardiac rhythm.

Physick-Sheard's past research

monitoring cardiac rhythms on race days showed that one in six Standardbred horses experienced cardiac arrhythmia immediately after races, when heart rates had lowered. His similar study on Thoroughbreds had different results, which he believes is because of their excitable natures keeping their heart rates elevated

longer than in Standardbreds.

Physick-Sheard is broadly analyzing information in the Ontario Racing Commission's Death Registry to identify any trends that might help researchers better understand why some horses are more susceptible to these sudden fatalities. Physick-Sheard's work will also help with ongoing research to determine the heart rate ranges that could cause cumulative heart muscle damage and develop protocols to detect that damage. Ultimately he would like to determine whether horses have evolved enough to safely handle work at such high intensities and, if not, what steps need to be taken to accommodate horses' physiological limits.

KEITH BETTERIDGE

Prostaglandin-induced embryonic loss in mares: a model of a wider problem

Using ultrasound technology, veterinarians and researchers are able to diagnose pregnancy in horses as early as within two weeks of conception. Researchers found the conception rate to be much higher than previously thought, but that many pregnancies were being lost within the first month. Mares were conceiving but not carrying the pregnancy to term.

Dr. Keith Betteridge of the Ontario Veterinary College is investigating what triggers embryonic loss by comparing the two-way biological communication between mare and embryo during normal pregnancies and in pregnancies made to fail by prostaglandin injection. His research also contributes to understanding how the uterine environment affects embryonic development and the nature of the communication needed to maintain pregnancy and produce healthy foals.

If scientists can identify what makes a mare susceptible to embryonic loss, it may become possible to prevent its occurrence.

JEFF THOMASON AND DIANE GIBBARD

Capsule endoscopy technology

Horses can experience many different types of abdominal pain, commonly called colic. Colic is often gastrointestinal in nature, but other factors may be involved as well, making accurate diagnosis and treatment difficult.

Graduate research by Diane Gibbard and Dr. Jeff Thomason of the OVC focused on the calibration and assessment of capsule endoscopy technology used in two trial horses. While standard endoscopy uses imaging equipment tethered to a flexible tube, capsule endoscopy is essentially a wireless camera disguised as "a pill" that is swallowed by the horse. With it the researchers captured high-quality video footage of the gastrointestinal tract that showed common parasites, food obstructions and lesions in various parts of the small intestine.

If the technology can be standardized as a diagnostic tool, veterinarians could significantly reduce suffering and stress levels during endoscopy procedures, and quickly and more accurately identify abdominal issues.



PHOTO: BARBARA SHERIDAN PHOTOGRAPHY

LUIS ARROYO

Arterial calcification

Scientists believe unexplained deaths in horses may be connected to the equine cardiovascular system. In particular, recent research done by Dr. Luis Arroyo of the OVC revealed 82 per cent of race horses studied showed signs of arterial calcification.

Arteries, especially pulmonary arteries carrying blood to the lungs, must expand to accommodate the higher pressure during exercise. The walls of these arteries can become stressed and damaged during high-intensity exercise. These stressed areas of the arterial walls can develop calcification similar to scar tissue, becoming hard, and inelastic, unable to safely accommodate the higher blood pressure during high-intensity exercise. This damaging cycle can lead to strains on the heart, and even fatal ruptures of major arteries.

Arroyo's research will lead to understanding this disease and may help scientists create preventative measures and treatments to reduce the fatalities caused by arterial calcification.

KATRINA MERKIES

Whip use in Quarter Horse racing

Traditional horse training often involves whip use in an attempt to make race-horses run faster. The main concern lies in the excessive use of the whip, as whip use can have negative physical and psychological effects on the horse. All horse racing organizations regulate whip use in races, and some countries have even completely banned its use.

Undergraduate research completed with Dr. Katrina Merkies at the University of Guelph's Kemptville Campus evaluated whip use in Quarter Horse races. Merkies found no correlation between frequency of whip use on each horse and its speed and placing in the



JEFF THOMASON

Track Surfaces

PHOTO: DAVE LANDRY

Horses' sensitive hooves can detect differences in the surfaces they're on, affecting how they move. Thoroughbreds and Standardbreds, bred lighter for speed, are susceptible to damage brought on by the high-intensity work in racing. Racetrack geometry and consistency are therefore important factors in injury prevention.

Research by Dr. Jeff Thomason focuses on hoof interactions with surfaces, the effects of various surface materials and track slopes. His research on different surfaces used in other disciplines has revealed that some injuries are discipline-specific, partially because the horse loads its feet differently depending on the activity.

Thomason's research is important for quantifying the footing consistency and geometry each discipline needs, reducing the impact surfaces have on the legs, reducing injuries and fatalities, and ultimately increasing the number of horses continuing to race and having second careers.

race; additionally, experienced jockeys were found to use their whips more, despite not placing higher in races than less experienced jockeys. This has significant implications for equine welfare: the racing industry could evolve to emphasize more accountability and transparency from the tracks, horse owners, trainers, and jockeys, and change to a more strategic and technical approach in training.

THOMAS KOCH AND JUDITH KOENIG

Stem cell advancements

Torn tendons usually do not fully recover. Usually, scar tissue forms around the injured area—a more inelastic form of

tissue than the uniformly fibroelastic tissue of normal tendons. This scar tissue makes the tendon tissue around it prone to re-injury. Dr. Thomas Koch and Dr. Judith Koenig of the OVC are studying the effectiveness of stem cells from umbilical cord blood in healing tendon injuries. Three horses have been treated with stem cells from unrelated foals; this allogeneic use of stem cells allows researchers to avoid harvesting stem cells from the patient itself, and allows earlier treatment. This research could mean reduced suffering, and stronger and faster healing—resulting in longer racing careers and perhaps allowing horses to start second careers in other disciplines.



PHOTO: NICHOLAS MURPHY

DOROTHEE BIENZLE
EPO drug use

Erythropoietin (EPO) drug use in horse racing is banned. EPO stimulates bone marrow to produce more red blood cells, which means oxygen is being provided to muscles for much longer, thereby improving the horse's aerobic performance. Synthetic EPO is used therapeutically

in humans but not in horses. EPO causes the blood to thicken, especially during exercise straining the heart's ability to pump blood, often causing strokes and heart attacks. Dr. Dorothee Bienzle of the OVC researches detecting synthetic EPO in

horses, working with horseracing regulatory agencies to develop a practical, feasible test for EPO drug use. This would make it easier for racing officials to enforce the ban on synthetic EPO use, meaning less use of the drug on horses, and preventing more horses from suffering from excessive EPO use.



PHOTO: NICHOLAS MURPHY

Equine Guelph's welfare education display appears at multiple events across Ontario including EquiMania!, to educate horse owners and the public on best practices and responsibilities around equine welfare. Katherine Hoffman (left) of the Ontario Ministry of Agriculture, Food and Rural Affairs and Gayle Ecker, director, Equine Guelph, are pictured here. Hoffman is an advisor to Equine Guelph on the welfare initiative as well as liaison with OMAFRA for contracts including technical large animal rescues and welfare programs.

SCOTT WEESE
Emerging disease and infection control

The risk of infection is a major issue in the equine industry, because horses travel internationally for breeding, competition, and other purposes. Scientists have developed vaccines and treatments for various infections, but the pathogens involved have adapted, becoming more drug-resistant and infectious.

Researchers such as Dr. Scott Weese from the OVC are investigating known and emerging infectious diseases. Weese studies the effects and changes in microbial populations in the horses' digestive tracts, and sources and carriers of infections.

Weese's research contributes to understanding how these pathogens operate, spread and affect horses. Weese says scientists will never be able to completely eradicate infectious diseases and pathogens will always evolve. This research will enable veterinarians to more easily recognize symptoms, diagnose problems, and

ultimately reduce sickness and suffering. Global and continent-specific pathogens lurk everywhere, and as a result, countries have enforced strict regulations for animal imports and exports. In Canada, surveillance systems are in place to monitor and assess risks, both inside the country and internationally, and strict quarantine regulations are also enforced for all imported equines. Weese's research focuses on improving biosecurity measures. Weese says 30 to 70 per cent of infectious diseases in Canada are preventable, emphasizing the need for every farm to develop and enforce a strong biosecurity action plan focusing on three main areas: decreasing exposure, decreasing susceptibility and increasing resistance to these pathogens. Examples of important biosecurity measures include controlling vector populations such as rodents and mosquitoes, vaccinating, quarantining, and minimizing contact between horses.