

Research focused on relief for joint disorders

Facilities offer hope for prevention, treatment of osteoarthritis

Dr. Mark Hurtig, Ontario Veterinary College (OVC), has established three laboratories, collectively known as the Comparative Orthopaedic Research Laboratory in the Equine Sciences Building, at the University of Guelph, which also houses the office of Equine Guelph.

As Director of this laboratory facility since 2000, Dr. Hurtig leads a group whose focus is on treatment of joint injury, prevention of arthritis and development of novel treatment strategies for both animals and people.

Dr. Antonio Cruz, faculty member and equine surgeon, OVC, is co-investigator on the equine studies.

The research draws on the expertise of veterinarians, engineers and human biologists, as well as human health care specialists and involves a number of projects to tackle post-traumatic osteoarthritis. This type of arthritis develops after a single or series of injuries to the joint surface causes the cartilage and underlying bone to deteriorate. Accumulated bone injuries lead to many of the serious injuries familiar to those in the racing industry such as knee and cannon bone fractures and osteoarthritis of the fetlock.



From top left: Michelle Beaudoin (technical staff), Nicole Kudo (technical staff), Ruth Campbell (undergraduate student), Karen Connolly (technical staff), Kyle Goldie (undergraduate student), Catherine Filejski (undergraduate student), Andre Quesnel (undergraduate student), Jody Johnson (technical staff), Dr. Antonio Cruz and Dr. Mark Hurtig.

Photo by Grant Martin

The research is aided by new equipment, including a \$300,000 micro-computerized tomography (micro-CT) device that makes 3-D X-ray images of bone and joint samples.

Data from these images allows researchers to study structural and material properties of joints such as bone density and architecture.

Drs. Hurtig and Cruz are engaged in a two-year study to assess the type of

injuries in Ontario racehorses. This research program includes detailed examination of the joints of any racehorse that is part of the Ontario Racing Commission's death registry program. Drs. Hurtig and Cruz are enthusiastic about the findings of this study as it is the first comprehensive assessment of the incidence and type of orthopaedic injury in Ontario racehorses.

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INSIDE

THE THREE PILLARS OF EQUINE GUELPH:

Research

The Equine Guelph Research Program has received proposals for new research projects for 2005-2006. After external peer review, the selected projects will be announced in May, 2005, by the research committee.

In one study, Dr. Laurent Viel, OVC Clinical Studies, and graduate student Cathy Furness are examining a method to recognize and identify damage to the airways of performance horses caused by exposure to environmental pollutants as might be found at the track or stable. Equine respiratory disorders manifested as inflammatory allergic airway disease can severely limit the athletic capacity of the horse. The goal is to assist veterinarians by establishing effective, long-term therapies to minimize permanent airway damage in these athletic horses.

Results of the current research funding competition will be featured on our Web site, as well as results of current and past research projects.

Performance

The Magnetic Resonance Imaging (MRI) facility is up and running at the Ontario Veterinary College (OVC). At peak capacity, six MRIs can be performed per day, each patient requiring between one and two hours for imaging. The MRI equipment has enhanced OVC's imaging and diagnostic capacity by giving clinicians the best possible detailed views of soft tissue inside the body. This information will enhance knowledge about illnesses as varied as cancer, arthritis and visual impairments.

Renovations should begin soon at the Equine Sciences Building as part of establishing Phase One of the Equine Performance Centre.

The search has begun for the head veterinarian for the Performance Centre. This single point of contact will coordinate the experts needed for each individual case and communicate directly with the owner and referring veterinarian.

Education

Equine Business Management, our new equine business course, is under development as a component of the Equine Science Certificate online program and will aid horse owners interested in going into the equine business. The goal is to help adults in developing a viable equine business using the skills and knowledge learned from the Equine Science Certificate.

"Adopting a sound business approach for your equine business is the critical first step for success and longevity in a competitive environment," says Melanie Prosser, Program Manager, Office of Open Learning, University of Guelph, and a former equine business owner.

"Many of us go into the horse business because we have a passion for the horse, but we must not forget to adopt sound business practices and do our homework."

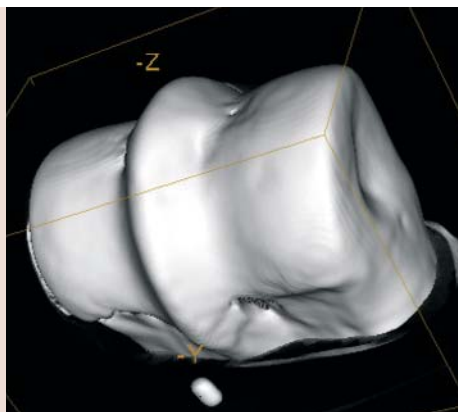
The course is expected to be available early in 2006. For more information, please contact Equine Guelph.

Joints, continued from Page 1

Cruz and Hurtig stress that this is only part of a larger program aimed at early detection of bone injury, monitoring of horses in training, and assessment of racetrack surface conditions.

For example, Drs. J.P. Dickey and Jeff Thomason, from the Departments of Human Biology and Biomedical Sciences, respectively, recently completed studies examining the effects of shoeing and racetrack surfaces on the feet of racing Standardbreds. The goal is to identify track and weather conditions that could increase the chance of injury.

Other studies ongoing in these laboratories and the OVC clinic include development of new methods for reconstructing subchondral bone cysts in the fetlock or stifle joints. These are cavities in the joint surfaces that arise from osteochondrosis or injuries and can lead



A 3-D X-ray image created by the micro-CT of a joint sample.

to osteoarthritis. This can be career ending for a racehorse.

Traditional treatments may be effective in young horses but only half of horses older than three years improve. New methods involving cylindrical bone grafts seem promising.

In collaboration with the School of

Engineering, the optimal size and number of grafts as well as the use of bioabsorbable cements are being explored. This approach improves the stability in the grafts, allows horses to walk on the repaired joint surface immediately after surgery, improves bone healing and creates a seal between the joint fluid and the porous bone.

"We need the grafts to be biomechanically stable because horses can't use crutches or rest with their feet up," Dr. Hurtig says. "We need a solution that allows horses to walk and stand immediately."

These projects are supported by the Equine Guelph Research Program as well as the Canadian Arthritis Network, the Canadian Institutes of Health Research, the Arthritis Society, the Ontario Ministry of Agriculture and Food, the Toronto Sports Medicine Foundation and the Morris Animal Foundation.

Mysteries of the hoof unravelled using MRI

Cutting-edge imaging project to study changes in horse's feet

Chinese traditional medicine teaches that good health for humans starts in the feet.

The same holds true for horses. And cutting edge imaging research at OVC focusing on horses' hooves may provide long-term benefits that reduce lameness and aid performance of equine athletes and pleasure horses.

Just as muscles and bones respond to work - when things go right, by getting bigger and stronger - the tissues that make up the horse's hoof will change in response to the stresses of walking and training. But those adaptive changes can be advantageous or disadvantageous and it isn't always clear why.

By using OVC's state-of-the-art Magnetic Resonance Imaging (MRI) unit, scientists will for the first time be able to examine the feet of living horses to track those changes.

"What's unique about what they're doing is that there is no other non-invasive way to get the level of detail that we believe we'll be getting with the MRI," says Dr. Howard Dobson, radiologist at OVC's Veterinary Teaching Hospital, who is consulting on the project.

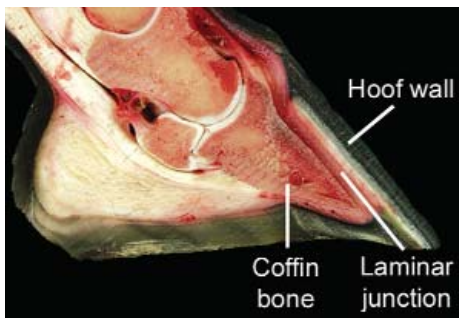
"We're taking technologies developed in human research and applying them to the horse's foot."

Dr. Jeff Thomason, Biomedical Sciences, and PhD student Babak Faramarzi will break new ground using specialized software to analyze the data and custom modifications to the MRI unit to maximize the resolution of the images.

Providing technical expertise for the project are McMaster University medical physicist Michael Noseworthy and Norm Konyer, a medical physicist at St. Joseph's Hospital in Hamilton. Konyer is building a customized coil -



Above: Norm Konyer, a medical physicist from St. Joseph's Hospital in Hamilton, fine-tunes the custom MRI coil that will be used in the project. Below: A cross-section of a hoof shows the triangular coffin bone connected to the hoof wall by the laminar junction.



the antenna that receives the signals from the object being scanned - to make it wrap around the hoof for a clearer image.

"There's enough evidence from the images that we have so far that we're fairly certain we'll be able to get the resolution we need. That's why we're sticking with it," Thomason says. "There is no way an equine field MRI could do this kind of imaging."

The project, which is still in the preliminary stages but should hit full stride by early summer, will use MRI to study the laminar junction: the layers of tissue that connect the hoof wall to the distal phalanx or coffin bone. It is the laminae

that transfer the forces of weight bearing from the coffin bone through the hoof wall to the ground. In effect, the coffin bone, and therefore the horse's weight, is suspended from the inside of the hoof wall by these delicate structures.

The study will focus on two groups of 10 horses each; one group will undergo an exercise regime over a six- to nine-month period while the control group will not. Using MRI at the beginning, end and middle of that time period, Faramarzi and Thomason will document the differences in the laminae of the two groups.

The MRI will allow Faramarzi and Thomason to examine the orientation, density, strain patterns and growth rate of the laminae in greater detail than ever before. It also allows them to continually modify their techniques to get the results they need.

"With an MRI, there are so many variables that we can study," Faramarzi says. "Even though MRI may not provide us with a clear image of each lamina, the calculations can tell us about them without actually seeing them."

If all goes according to plan, Faramarzi and Thomason will be able to publish a protocol for using MRI to examine the laminar junction. They may also provide veterinarians with a new diagnostic tool for dealing with laminitis - pathological changes of the laminae - a devastating condition with a variety of manifestations and causes that are not yet well known.

Eventually, the research should also provide new information to help farriers refine their trimming and shoeing techniques.

"The whole industry is based on observation and trial and error, which is fine because they have thousands of years of experience to build upon," Thomason says. "I'd like to get it on a more scientific footing and add a degree of predictability that's not there now."

-Barry Gunn

OEF joins Advisory Council of Equine Guelph



From left to right, Marcia Barrett, OEF Executive Director, Al Patterson, Past-President, Allan Ehrlick, President, and Jack deWit, Vice-President.

The Ontario Equestrian Federation (OEF) has joined the Advisory Council of Equine Guelph, representing the interests of the non-racing sector of the equine industry.

The OEF shares our vision of creating youth initiatives that will ultimately develop into curriculum units for the school system. The main goal is to encourage youths to consider a career in the horse industry, as well as encouraging involve-

ment in the industry.

OEF has agreed to distribute the Equine Guelph newsletter in their publication, Whoa! as well as provide web links to inform their members about Equine Guelph activities.

As part of the annual renewal of membership for the OEF there is also a check box for those wishing to support the programs of Equine Guelph through donations.

Funding Partners

E.P. Taylor Equine Research Fund
Horsemen's Benevolent and Protective Association of Ontario
Ontario Harness Horse Association
Ontario Horse Racing Industry Association
Ontario Ministry of Agriculture and Food
University of Guelph

Visit www.equimania.ca

Through its education programs, Equine Guelph promotes horse health and safety. "EquiMania! is our new e-initiative aimed at youth aged 10 to 14," says Gayle Ecker, senior manager. "We hope it will encourage our youth to become interested in horses through learning about health, disease prevention and management in a fun and interactive environment."

About Equine Guelph

Equine Guelph is the horse owner and caregiver's centre at the University of Guelph. We are dedicated to improving the health and well-being of horses through the provision and promotion of research, performance and education.

We welcome your views and encourage you to contact us with your comments or suggestions. Anyone wishing to excerpt Equine Guelph Update should contact:

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Equine Guelph also publishes a bi-monthly e-newsletter, Horses@Guelph. To subscribe to the e-newsletter, please visit www.equineguelph.ca

Equine Guelph Donation Form

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Area of Greatest Need Research Performance Education

Equine Guelph also offers a memorial program to honour deceased horses or people. Please call the office for details.

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