



PennVet New Bolton Center

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For Immediate Release

Penn Vet's New Bolton Center Launches Revolutionary Robotics-Controlled Equine Imaging System *New technology will benefit animals and humans*

[April 27, 2016; Kennett Square, PA] – Penn Vet's New Bolton Center has completed installation of a revolutionary robotics-controlled imaging system for use in the standing and moving horse, and in May will start exploring limited diagnostic imaging on patients.

The University of Pennsylvania School of Veterinary Medicine (Penn Vet) is the first veterinary teaching hospital in the world using the EQUIMAGINE™ system, which has clinical and research applications for both animal and human medicine.

New Bolton Center veterinarians are developing the application-related protocols for use of the system with large animals, in collaboration with Four Dimensional Digital Imaging (4DDI), the company behind the innovation of the system. ABB, a leading global manufacturer of industrial robots, supplies the robots and many of the control components used in 4DDI systems.

Penn Vet experts are working with colleagues at Penn Medicine and Nemours Children's Health System to identify and develop applications in human medicine. There is great potential, in particular, for the musculoskeletal system such as joints and the spine, cardiovascular interventions, and pediatrics, primarily because of the ability to obtain high-quality images while the patient is in motion.

"We think the system is not only beneficial to horses, but also will have translational benefits for people," said Dr. Barbara Dallap Schaer, Medical Director of New Bolton Center, the large-animal hospital of the University of Pennsylvania School of Veterinary Medicine.

"This effort is a collaboration," she said. "We are trying to bring together all of our strengths at Penn to be truly transformational."

The EQUIMAGINE™ imaging system arrived at New Bolton Center in February and has

been going through a complex installation process, with a team of experts working on initial application-related tuning and testing for use with a standing horse.

The system is capable of capturing the equine anatomy in a way never before possible, while the horse is awake and load-bearing. Existing computed tomography (CT) systems usually require the horse to be anesthetized, and are limited to the parts of the animal that fit into the cylindrical machines.

“The robots can easily move all around the horse in any orientation while the horse is standing, so we can see many parts of the anatomy we’ve never seen before, and do it in a patient that is awake,” Dallap Schaer said.

The robotics-driven technology unites automation with powerful algorithms that can perform multiple modalities, unencumbered by an enclosed gantry or a C-arm, making it possible to scan any part of the horse.

The robot-powered imaging modality can collect typical, two-dimensional CT images; create three-dimensional images; produce 360-degree digital radiographic studies; and capture fluoroscopic images at up to 16,000 frames per second. Tomosynthesis, a modality that produces extremely high-resolution images of a focused area of clinical interest, will be explored in the near future. Eventually, researchers, clinicians, and engineers hope to program the robots to capture images of a horse running on a treadmill.

The quality and resolution of the real-time images created with the EQUIMAGINE™ system far exceeds existing technology, experts from Penn Vet and 4DDI say. And the system makes imaging much more efficient and effective. The three-dimensional scans take less than a minute, a fraction of the time it takes to produce multiple static images that have limited diagnostic value.

Most specialists at New Bolton Center will be able to take advantage of the technology, including but not limited to those in surgery, sports medicine, neurology, cardiovascular medicine, and internal medicine.

“The possibilities are almost unlimited in terms of the conditions that can be addressed with this system,” Dallap Schaer said.

Dr. Dean Richardson, Chief of Surgery at New Bolton Center, is providing surgical expertise for the further refinement of the new system, especially with respect to orthopedics. Richardson has vast experience using CT imaging during surgery to treat horses with serious fractures.

“Three-dimensional imaging provides the opportunity to be more precise in our treatments. That’s a big step forward,” Richardson said. “The goal in veterinary and human medicine is to provide less invasive and more precise surgical procedures.”

The images from the new system are much more detailed, Richardson said, and can help to identify not only a fracture, but also its specific characteristics: location, depth, and breadth. He expects the new technology will help prevent injuries, especially in racehorses, by allowing early detection of fractures.

“We have a lot to learn about this technology,” Richardson said. “Three-dimensional imaging opens new doors to diagnosis and treatments. We are very excited to be on the forefront of those discoveries.”

The system will be important not only for clinical use in the hospital, but also for research and teaching.

Penn Vet researchers and clinicians are in discussions with colleagues at Penn Medicine, Nemours Children’s Health System, and other human medical centers about possible applications of the new imaging system.

The ability to obtain high-quality images of a joint in motion, or the spine, or the head, could open up vast possibilities of discovery in the areas of diagnosis, treatment, and medical product development. In pediatric patients, it would allow imaging of a child while awake and moving, rather than under general anesthesia or while restrained.

“This technology enables us to push the ‘One Health’ research frontiers in imaging to better understand potential new pathologies that haven’t been detected before,” said Dr. Thomas Schaer, Director of Penn Vet’s Preclinical Service Core & Translation in Orthopedic Surgery, who is leading the translational research efforts.

There are great possibilities for teaching, as well. “Three-dimensional imaging is an enormously valuable tool in teaching anatomy, and there is nothing more important in the education of a medical specialist than understanding anatomy,” Richardson said.

New Bolton Center was chosen by 4DDI as the beta site because the veterinary experts are willing to collaborate to develop the protocols for use with large animals, said Nicholas Hunt, Chief Technology Officer for 4DDI.

“At 4DDI we are excited that New Bolton has chosen EQUIMAGINE™ to develop these new technologies,” said Hunt, who has led the team doing the installation.

The horse is probably “the most sophisticated and difficult patient we will ever encounter,” because of the size and complexity of the animal, as well as the need to correct for motion, said Yiorgos Papaioannou, 4DDI Chief Executive Officer.

“If we are able to tackle and solve the challenges with the horse, the technology could be easily transferred to other domains of imaging, in humans, or small animals,” he said. “It’s a great opportunity for us to validate our work with renowned academics, surgeons, radiologists, and radiographic technicians.”

Christos Mitrogiannis, a specialist from 4DDI, will work with New Bolton Center clinicians during the first year to further the application capabilities of the system. In addition, radiologist Dr. Chris Ryan is now on New Bolton Center's staff as part of the project, dedicated to interpreting the new digital images.

"My goal is to help bring this new robotic imaging modality from the research and development phase to every day clinical use," Ryan said.

The acquisition of the system was funded in part by a generous gift from the estate of Mimi Thornton. The purchase includes four robots: the two large units now installed in New Bolton Center's treadmill building, and two smaller units to be installed near New Bolton Center's orthopedic surgery suite this year. Additional gifts will help to integrate the new technology into the clinical and research programs at New Bolton Center.

"New Bolton Center has a history of advancing equine surgery and medicine," Richardson said. "This system is just one more tool that will prove New Bolton Center is on the forefront of veterinary medicine."

For more information, visit www.vet.upenn.edu/equimagine. Members of the media can download video, images, and press kit materials at www.vet.upenn.edu/equimagine-press.

About Penn Vet

The University of Pennsylvania School of Veterinary Medicine (Penn Vet) is a global leader in veterinary education, research, and clinical care. Founded in 1884, Penn Vet is the first veterinary school developed in association with a medical school. The school is a proud member of the One Health initiative, linking human, animal, and environmental health.

Penn Vet serves a diverse population of animals at its two campuses, which include extensive diagnostic and research laboratories. Ryan Hospital in Philadelphia provides care for dogs, cats, and other domestic/companion animals, handling more than 30,000 patient visits a year. New Bolton Center, Penn Vet's large-animal hospital on nearly 700 acres in rural Kennett Square, PA, cares for horses and livestock/farm animals. The hospital handles more than 4,000 patient visits a year, while the Field Service treats nearly 37,000 patients at local farms. In addition, New Bolton Center's campus includes a swine center, working dairy, and poultry unit that provide valuable research for the agriculture industry.

For more information, visit www.vet.upenn.edu.

About 4DDI

4DDI's technology was developed over the past decade as a solution to address many of the shortcomings and limitations of conventional imaging technology. Originally intended for human application, 4DDI's robotics-controlled imaging system has been adopted for animal and industrial applications. Its innovative employment of industrial

robots to manipulate the imaging apparatus, coupled with 4DDI's proprietary software, provides an unlimited scanning geometry capable of producing images of an unprecedented quality and resolution.

For more information, visit www.equine4ddi.com.

About ABB Robotics

ABB Robotics is a leading supplier of industrial robots – also providing robot software, peripheral equipment, modular manufacturing cells, and service for tasks such as welding, handling, assembly, painting and finishing, picking, packing, palletizing, and machine tending. Key markets include automotive, plastics, metal fabrication, foundry, electronics, machine tools, pharmaceutical, and food and beverage industries. A strong solutions focus helps manufacturers improve productivity, product quality, and worker safety. ABB has installed more than 250,000 robots worldwide.

For more information, visit www.abb.com/robotics

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