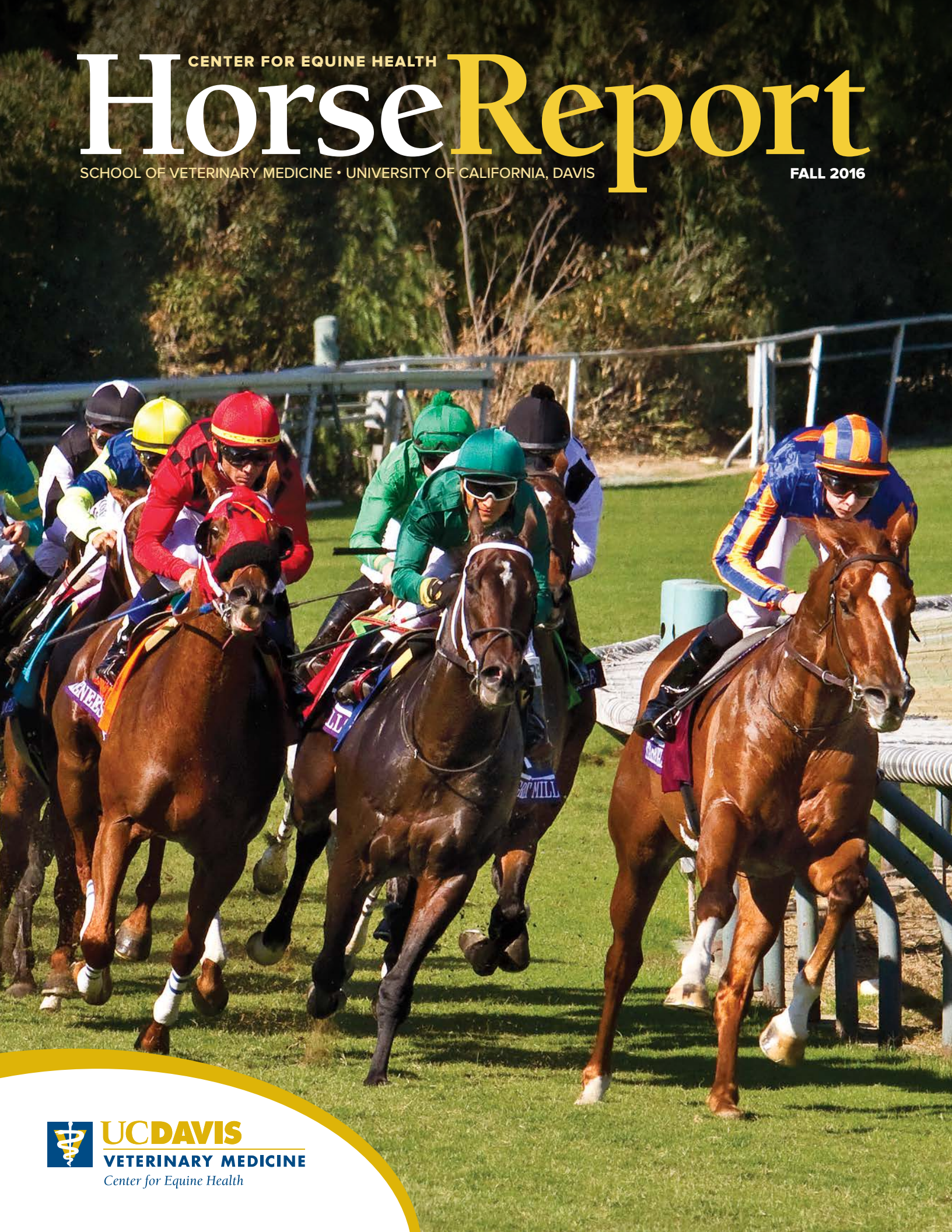
CENTER FOR EQUINE HEALTH

Horse Report

SCHOOL OF VETERINARY MEDICINE • UNIVERSITY OF CALIFORNIA, DAVIS

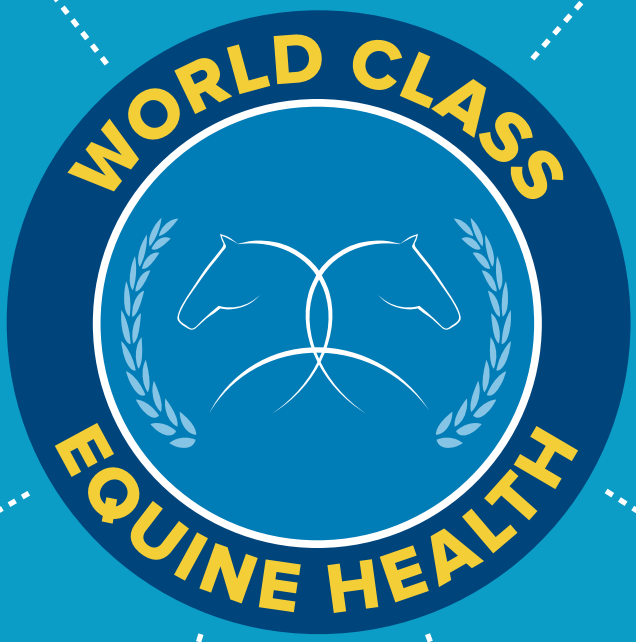
FALL 2016



UCDAVIS
VETERINARY MEDICINE
Center for Equine Health

At your service in California...

With the principal focus on equine health, an array of expertise and leadership combine to investigate disease, improve techniques, identify treatments, and advance knowledge—to preserve and improve the health and welfare of these magnificent animals worldwide.



Center for Equine Health

Advancing the health, welfare, performance and veterinary care of horses through research, education, and public outreach

Claire Giannini Hoffman Equine Athletic Performance Laboratory

Developing analytical methods for accurately evaluating the athletic conditioning and performance capability of horses

Veterinary Hospital

Providing cutting-edge equine care by board-certified experts in equine medicine and surgery at the most advanced and comprehensive veterinary hospital in the world

Veterinary Institute for Regenerative Cures

Developing and integrating regenerative medicine discoveries into clinical practice through collaborative, cutting-edge stem cell research programs and initiatives

Veterinary Center for Clinical Trials

Advancing medical care for horses by developing and investigating alternative diagnostic approaches and treatments for a variety of diseases

California Animal Health and Food Safety Laboratory

Discovering the cause of racetrack fatalities (72 percent are due to injuries), by performing necropsies on all racehorses fatally injured or euthanized due to medical issues on California racetracks

J.D. Wheat Veterinary Orthopedic Research Laboratory

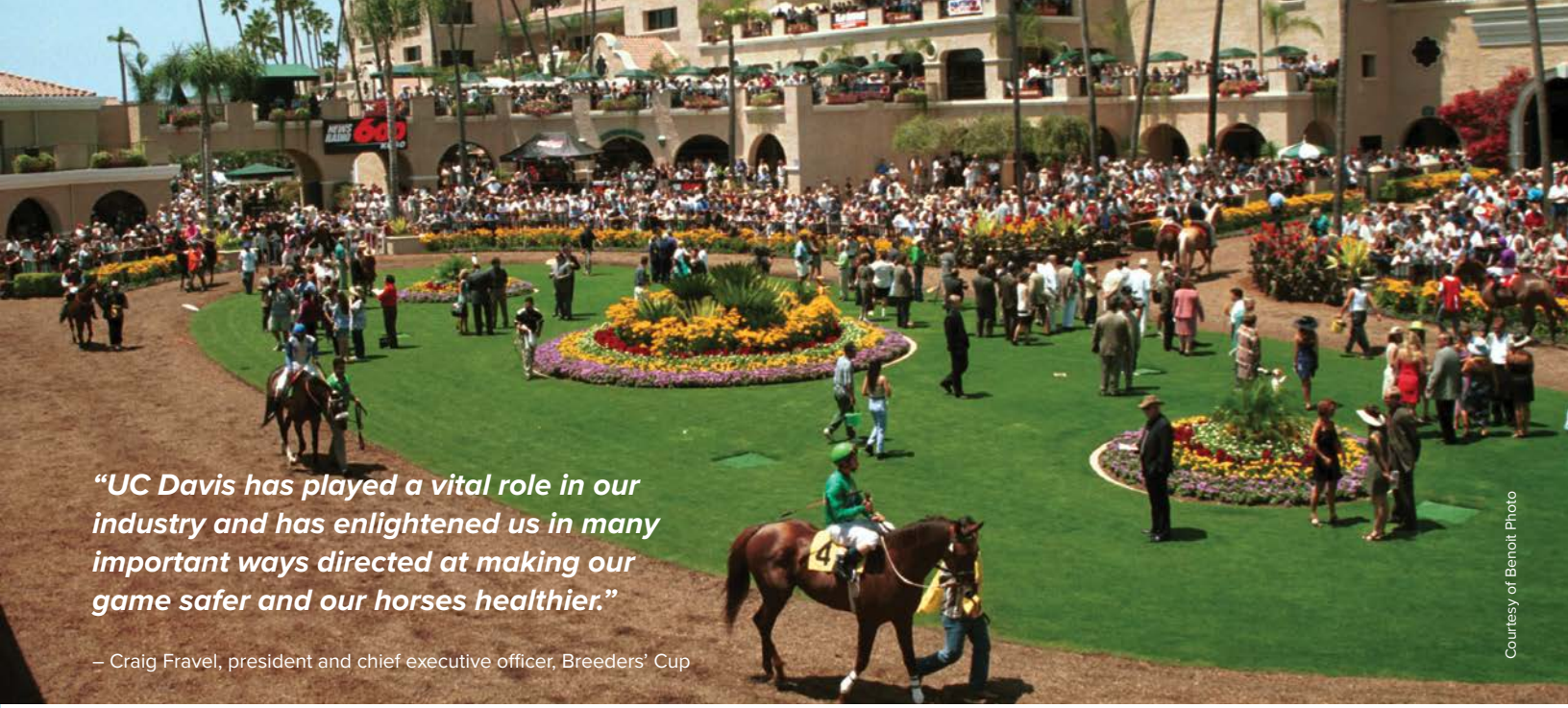
Advancing knowledge of equine orthopedics, gait analysis and investigation of the underlying causes of bone fractures, their prevention, and new methods of fracture repair

Kenneth L. Maddy Analytical Chemistry Laboratory

Utilizing state-of-the-art technology and methodologies to study distribution of medications within a horse's system, and investigate new classes of drugs with potential for abuse

California Horse Racing Board

Ensuring the integrity, viability, and safety of the California horse racing industry



"UC Davis has played a vital role in our industry and has enlightened us in many important ways directed at making our game safer and our horses healthier."

– Craig Fravel, president and chief executive officer, Breeders' Cup

Courtesy of Benoit Photo

Creating a Lasting Legacy

For nearly 30 years, the UC Davis School of Veterinary Medicine (SVM) has enjoyed a mutually beneficial relationship with the California Horse Racing Board (CHRB), which is legislatively mandated to preserve and enhance the integrity of horse racing in the state. By partnering with the CHRB on multiple initiatives, the SVM works to ensure a safe and secure future for racing in California.

By providing research funds from industry and individuals, and building on other resources throughout the SVM, UC Davis' Center for Equine Health (CEH) plays an important role in fulfilling the CHRB's mandate. Some of the brightest minds in equine medicine make up the UC Davis faculty and are world-renowned in their areas of expertise. They collaborate to achieve the optimum in equine health.

The health of the racing industry depends on the health of the horse on the track.

Setting the Standard in Equine Care

- **Exercise Induced Pulmonary Hemorrhage (EIPH) –** The SVM played a major role in initial investigations of EIPH in the 1980s and 1990s. Studies funded by the Grayson-Jockey Club Research Foundation and the CEH are investigating new approaches to managing EIPH in racehorses.
- **Positron Emission Tomography (PET) –** The SVM is the first veterinary facility in the world to utilize PET scanning on horses, which helps detect active changes in tissue before a horse is sidelined by injury and is advancing musculoskeletal research.
- **Decline in Catastrophic Breakdowns –** Research focused on improving screening and safety of equine athletes has contributed to a 30 percent decline in catastrophic breakdowns on California racetracks in the past eight years.
- **Equine Protozoal Myeloencephalitis (EPM) –** Research identified the organisms that cause EPM and led to the development of a preventative treatment program to dramatically reduce infection of weanlings.
- **Complete EPM Screening –** Laboratories offer the only commercial platform that tests for both *Sarcocystis neurona* and *Neospora hughesi* antibodies.
- **World Leaders in Equine Infectious Disease –** Specialists developed advanced diagnostic testing and biosecurity protocols for numerous infectious diseases relevant to the racing industry such as equine herpesvirus 1 and influenza.
- **On-Track Emergency Veterinarians –** For two decades, board-certified clinicians have served as on-track emergency veterinarians at the Breeders' Cup and other racing events throughout California.

Protecting Racing Integrity

In order to ensure the integrity of horse racing in California, the Kenneth L. Maddy Equine Analytical Chemistry Laboratory (EACL) was authorized in 1993 through legislation authored by California State Senator Ken Maddy. The EACL started testing samples in 2000 and became the sole CHRB anti-doping service by 2005.

Equine Analytical Chemistry

A robust and aggressive anti-doping program is the cornerstone to protecting the integrity of horse racing and the safety of horses and human athletes. In California, nearly $3 billion are wagered on horse racing each year, with more than 5,000 races and 40,000 horse starts. Using cutting-edge technology, the EACL analyzes more than 12,000 post-race blood and urine samples. With the addition of pre-race, post-race, out-of-competition, and evidentiary samples, the laboratory facilitates more than 50,000 tests per year.

Important projects conducted by the chemistry section include:

- Development of testing technology that is now the gold standard for substance detection
- Regulation of bicarbonate loading ("milkshaking") in Thoroughbred racing
- Creation of methods for identification of dermorphin, nikethamide, selective androgen receptor modular, and other Association of Racing Commissioners Class 1 substances – all prohibited performance enhancing drugs
- Customization of state-of-the-art technology used to detect growth promoters and other emerging threats facing the performance horse industry
- Development of hair testing to better control abuse of anabolic agents and other drugs

Equine Pharmacology

Ensuring the safety and welfare of racehorses through the establishment of appropriate regulatory recommendations and providing information to veterinarians—so they can effectively treat these athletes—is integral to an effective drug testing program. The EACL pharmacology section is instrumental in providing much needed drug withdrawal information to veterinary practitioners. It manages an exercised research herd comprised of former racehorses, whose fitness levels are maintained by using high-speed treadmills located in the Equine Athletic Performance Laboratory. The EACL pharmacology section has published numerous studies describing the pharmacokinetics and pharmacodynamics of equine drugs including cobalt administration in horses. Data generated from these studies has been utilized by national and international regulatory agencies to set appropriate thresholds for therapeutic drugs and medications.

Important projects conducted by the pharmacology section include:

- Establishment of molecular models (gene expression) to characterize the duration of drug activity
- Identification and characterization of mutations in drug metabolizing enzymes that have the potential to impact drug pharmacokinetics and clinical effects
- Extensive research to characterize the pharmacokinetics and clinical effects of corticosteroids and the establishment of biomarkers for corticosteroid administration in horses
- Investigation of the effectiveness of furosemide in the treatment of EIPH, utilizing varying dosing protocols

"UC Davis has created a lab that is second to none in the testing of horses for illegal drugs in order to eliminate inappropriate use thereof, thus benefitting the wagering world and the integrity of the sport."

– Sherwood Chillingworth, executive vice president, Oak Tree Racing Association

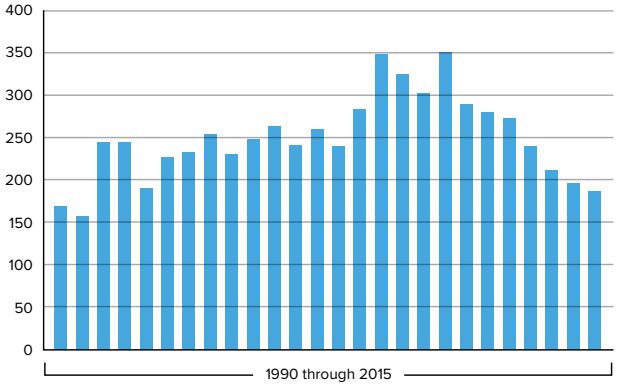
Postmortem Examinations

In 1990, the California State Legislature—seeking to improve safety and welfare of jockeys and racehorses—established the Postmortem Examination Program to be administered by the UC Davis California Animal Health and Food Safety Laboratory System. The program requires that a postmortem examination (necropsy) be performed on every horse that dies spontaneously or is euthanized on California racetracks or training facilities. To date, more than 6,500 horses have been necropsied as part of this program, which is now a national and international model for the racing industry.

This program has allowed researchers to:

- Focus research on specific circumstances surrounding deaths
- Determine that the majority (90 percent) of those deaths were preventable
- Develop clinical tools to further diagnose and treat racing injuries

California Horse Racing Board Postmortems – Per Year



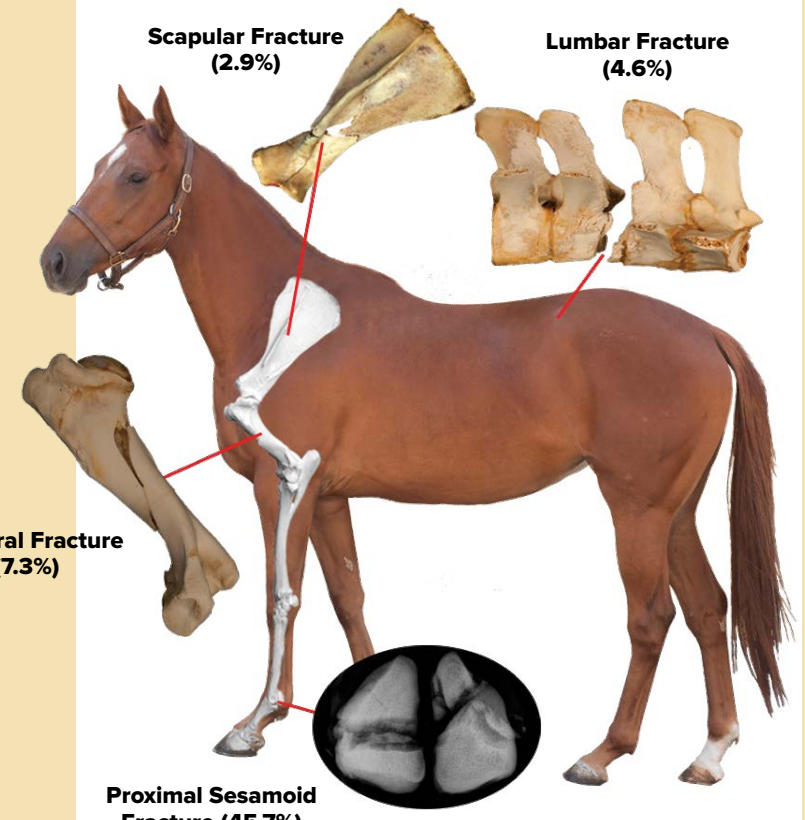
Reducing Catastrophic Injuries

The J.D. Wheat Veterinary Orthopedic Research Laboratory (VORL) at UC Davis specializes in musculoskeletal injuries—those that impact bones, joints, cartilage, muscles, tendons and ligaments. The team works to identify the cause and development of injuries, and the risk factors associated with those injuries. By identifying these components, the laboratory is able to design strategies for injury prevention.

Key VORL discoveries:

- The majority of catastrophic racing and training bone fractures and joint injuries have pre-existing bone remodeling or stress fractures at the site of their fatal injury, meaning, **catastrophic injuries are preventable with:**
  - Early detection of stress fractures and rehabilitation of affected racehorses
  - Management of the training and race surfaces of racehorses to prevent stress fractures—research is ongoing to develop a rating system for track safety
- Racetrack surface properties affect limb motions and thus propensity for injury.
- The greatest cause of jockey injuries are falls from racehorses that sustain a catastrophic injury. Therefore, prevention of catastrophic injuries in racehorses improves jockey safety.

Common Injuries in Racehorses



Musculoskeletal related deaths during the past 5 years = 840


X-ray


Ultrasound


CT


Nuclear Scintigraphy


MRI


PET

Advancements in Hospital Care

Equine specialists at the UC Davis veterinary hospital are continually utilizing advancements in medical disciplines and technology to improve the outcome for racehorses injured on the track.

Improved Joint Repairs

Degenerative joint disease and traumatic joint injury are common in racehorses, but effective therapies have historically been lacking. Collaborations between veterinarians and biomedical engineers have resulted in biological treatment options for joint health, such as the development of "neocartilage" to function like native articular cartilage. This research may dramatically improve athletic outcomes for horses and humans alike.

Improving Fracture Repair Outcomes

Surgeons are exploring the effectiveness of stem cell therapies to expedite bone healing following surgical repair. In addition, the use of three dimensional imaging prior to surgery facilitates optimal repair and stabilization. This work will likely reduce fracture-associated complications such as infection, delayed healing and support limb laminitis.

Imaging Helps Advance Stem Cell Treatments

Stem cells derived from equine bone marrow and fat direct the immune response to tissue damage and help to organize healing. Radiologists are pioneering the use of imaging technology to track the activity and influence of stem cells in acute tendon lesions in horses. Nuclear medicine (scintigraphy and PET) and MRI are used to determine distribution and persistence of stem cells, and also illustrate their exact location after administration.

Imaging Modalities Help Translate Research to Clinical Care

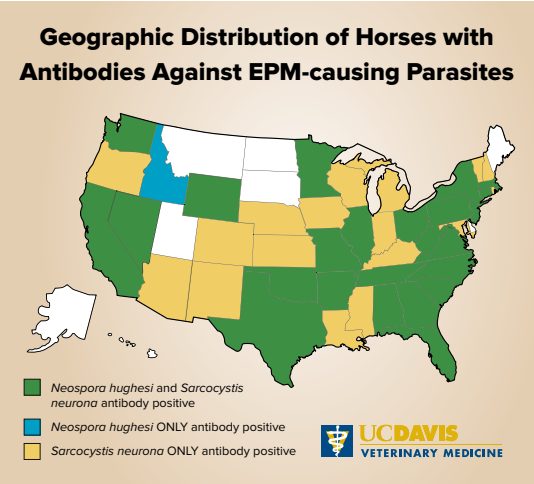
With some of the most advanced and exclusive imaging capabilities, UC Davis is at the cutting edge of detecting, diagnosing and treating racing injuries. By utilizing information learned through research, radiologists and clinicians at the veterinary hospital can advance the care and rehabilitation of racehorses.

Imaging procedures for horses include:

- Radiography (X-ray)
- Ultrasound
- Computed Tomography (CT)
- Nuclear Scintigraphy
- Magnetic Resonance Imaging (MRI)
  - Allows clinicians to see early changes in tissues around tendons and ligaments, potentially before a tear occurs—researchers are working on translating this finding into a clinical tool for earlier detection of soft tissue overload
- Positron Emission Tomography (PET)
  - Indicates what is active in the image—similar to nuclear scintigraphy but in three dimensions with anatomical accuracy

Neonatal Care

The Lucy G. Whittier Neonatal Intensive Care Unit is led by a board-certified critical care specialist and can handle the most complicated cases including: prematurity, colic, maladjusted foal syndrome, angular limb deformities and sepsis. Research has demonstrated that compromised foals have gone on to have successful racing careers and that early, active intervention is key to a positive outcome.



Infectious Disease Research and Control

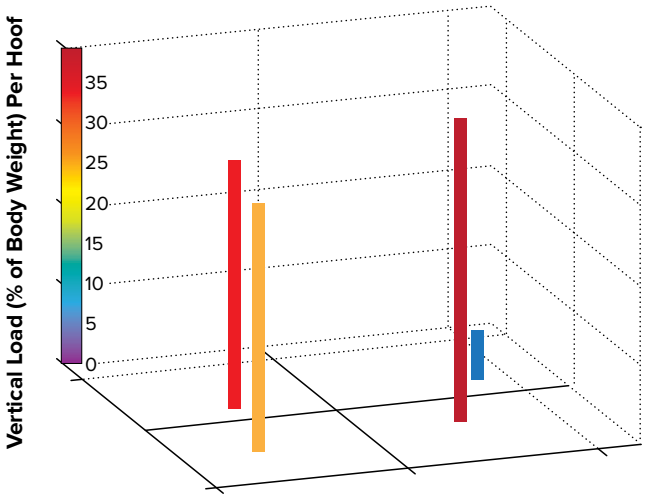
UC Davis leads infectious disease research in equine medicine. Researchers have developed tools to prevent, diagnose and treat infectious diseases before they shut down a racing barn.

- Biosecurity protocols for EHV-1 and other transmissable diseases are being implemented nationwide and promoted by leading pharmaceutical companies.
- Development of a rapid turnaround PCR diagnostic testing panel for respiratory and gastrointestinal pathogens that are utilized nationally in the face of outbreaks.
- Research discovered the prevalence of EPM throughout the country, and clinicians developed educational tools for veterinarians to accurately diagnose and treat EPM cases.
- Research has shaped recommendations for shipping and hauling to reduce transportation-associated infections and complications.

Advancing the Art of Lameness Detection

Sports medicine specialists are utilizing the latest technological advances to improve lameness detection and objective assessment (measurement). The key to successful resolution of unsoundness is accurate diagnosis and determination of primary versus secondary sources of pain. Early detection of problems—before the horse is sidelined—improves return to athletic function and reduces the likelihood of re-injury. Clinicians integrate complementary medicine (acupuncture and chiropractic evaluation) to enhance diagnostic and therapeutic capabilities. These modalities provide additional information about axial skeletal issues and compensatory pain.

Research teams are utilizing force plate and inertial sensing technology to quantify limb load changes and distribution of force across the hoof. This technology reveals compensatory loading that the naked eye cannot detect.



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CEH Philanthropic Initiative Reaches Goal

Dr. Gregory Ferraro

Alumni, friends, and industry partners joined together to create the endowed directorship for the Center for Equine Health. This endowment will last in perpetuity and will forever be linked to the extraordinary work of Director Emeritus Dr. Gregory Ferraro.

Ferraro, an alumnus of the School of Veterinary Medicine, served as the director from 1997 to 2013, and led the center to new achievements, including increased research funding for faculty and residents, fellowships for graduate students, and development of a world renowned regenerative medicine program.

Recognized internationally for his excellence in equine surgery, Ferraro also taught at UC Davis and served as the associate director of the Large Animal Clinic in the Veterinary Medical Teaching Hospital prior to his retirement.

"We are grateful to many for their generous philanthropic support of this new fund. It will stand as a legacy to Dr. Ferraro and will help all future CEH directors have the resources to respond to emerging opportunities to improve the health of our horses. Dr. Ferraro secured the CEH as a world leader in advancing veterinary medicine and served as a mentor to many in clinical and research roles. I cherish his mentorship to me personally and the leadership he has provided for our profession."

– Dr. Claudia Sonder, CEH director

If you would like to support the Center for Equine Health, please visit: **https://give.ucdavis.edu/Go/CEH.** For information on how you can include the Center for Equine Health in your estate plans, please call the Office of Development at 530-752-7024.

"We now know from the necropsy program and related studies that very few injuries are just one bad step. Knowing when, where and how injuries happen is critically important for a horse to have a long racing career."

– Richard Mandella, former Hall of Fame trainer

www.vetmed.ucdavis.edu