CEH Focused Research Initiatives

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The Center for Equine Health has established several focused research initiatives to concentrate resources, expertise, cutting-edge technology and state-of-the-art equipment in certain areas of scientific research. These initiatives are conducted under the auspices of the CEH and were founded by the generous contributions of private individuals and/or organizations concerned with the health and well-being of animals, especially horses.

Established in 1988, the **J. D. Wheat Veterinary Orthopedic Research Laboratory** focuses on equine musculoskeletal diseases. In 1997, the Dolly Green Research Foundation of Southern California provided a $1 million endowment in Dr. J. D. Wheat's name. Dr. Wheat is a professor emeritus and a founding faculty member of the UC Davis School of Veterinary Medicine whose visionary leadership helped develop this orthopedic research laboratory. The Dolly Green Foundation, having recognized the orthopedic laboratory's contribution to the welfare and protection of the equine athlete, wanted to protect the work of ensuing generations of scientists and to honor one of its founding scientists.

Performance horses incur a wide variety of athletic injuries that are unique to their particular athletic pursuit. Scientists are working hard to discover risk factors, preventive measures and effective treatments for each. The orthopedic laboratory has expanded its scope to include companion animals, livestock, and wildlife species. Under the direction of Dr. Susan Stover, the orthopedic laboratory's vision is to (1) improve sport horse and companion animal welfare, (2) understand causes of injury and disease, (3) develop better methods for diagnosing, treating, and preventing injury and disease, and (4) provide education to ensure that equestrian sports, pleasure riding and companion animals may be safely enjoyed.

Over the past few years, researchers in the J. D. Wheat Veterinary Orthopedic Research Laboratory have achieved some major accomplishments that will significantly benefit horse-racing:

- Discovered that stress fractures precipitate catastrophic fractures.
- Discovered new sites, now routinely examined, for stress fractures.
- Advocated bone scan (scintigraphy) installation at Santa Anita Racetrack.
- Developed new bone scan views to enhance detection of stress fractures.
- Associated high-intensity exercise with increased risk for skeletal injury.
- Determined that high-intensity exercise increases risk for lay-up.
- Determined that lay-up increases risk for catastrophic humeral fracture.

♦ Associated horseshoe toe grabs with increased risk for injury, especially suspensory apparatus failure (fetlock breakdown).

♦ Discovered osteoarthritis in the back and pelvis of over 25% of racehorses.

♦ Developed new, improved techniques for sampling and treating the fetlock and pastern joints.

♦ Improved methods for fracture repair.

♦ Improved understanding of joint cartilage inflammation and function.

Great strides have been made in discovering the causes of catastrophic injury in racehorses. We now have a better understanding of the events leading to bone fracture and better techniques to detect stress fractures in live horses. We can identify exercise factors that place horses at increased risk for catastrophic injury and provide horseshoe recommendations to prevent suspensory apparatus injury. But the challenge continues in order to make horse-racing a safe sport for horses and people.

To contact the J. D. Wheat Veterinary Orthopedic Research Laboratory, visit their Web site at ***www.vetmed.ucdavis.edu/vorl***, or telephone Dr. Susan Stover at (530)752-8388 (e-mail: smstover@ucdavis.edu).

In January 2001, the **Bernice Barbour Communicable Disease Laboratory (BBCDL)** was established to conduct research devoted to investigating the mechanisms by which infectious diseases are produced. The Bernice Barbour Foundation, Inc., was established by the late Bernice Wall Barbour of New Jersey, who devoted her life to making the lives of animals happier and healthier. The Foundation's trustees are concerned that the increasing voracity of infectious agents poses a serious threat to the well-being of all creatures. The BBCDL was established to address this problem.

Infectious communicable diseases pose one of the major threats to worldwide health in the 21st century. Currently, the capacity of many infectious oganisms to adapt and mutate far exceeds the medical community's ability to respond with new strategies for control. The resilience of these pathogenic microbes, combined with the rapidity with which humans and animals currently circumvent the globe, present today's biomedical scientists with a most difficult challenge.

The BBCDL employs an innovative approach to accomplish its goals. Instead of studying specific diseases in isolation, the laboratory provides a research umbrella under which scientists from varying disciplines work together as a team to study disease-causing microbes throughout the world. The BBCDL's work focuses on three critical areas of infectious disease research: (1) the microorganism's life outside the host, (2) the pathogenic mechanisms used by microorganisms to invade the host and cause disease, and (3) the defense mechanisms used by hosts against microorganisms.

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Some major accomplishments to date include:

♦ Acquisition of new information on *Cryptosporidium parvus*, the waterborne protozoal disease, which remains a significant public health threat in the United States. Specifically, researchers conducted a comprehensive evaluation of the hydrological transport of *C. parvus* oocysts in groundwater and riverine systems.

♦ Development of predictive models on the rate of environmental inactivation of infective *C. parvum* oocysts for use in improving environmental regulations for livestock grazing on watersheds and in ensuring water quality.

♦ Development of methods to study disease outside of the horse—the "horse in the Petri dish." We are now able to study the cells involved in infections in the horse in laboratory cultures. We use monocytes from blood, alveolar macrophages from the lung, endothelial cells that line the blood vessels, and dendritic cells (the first and most important cells that need to interact with an invader) to study disease virulence and host immune response. These cell culture systems, which allow us to study the interactions of pathogens in the horse without the need to use whole animals, are a significant boost to advancing the study of equine infectious diseases.

♦ This lab supports one full-time cell biologist specializing in disease infection and host response.

♦ Training the next generation of scientists in the area of waterborne zoonotic diseases, environmental health assessment, and host/pathogen interactions.

To contact the Bernice Barbour Communicable Disease Laboratory, visit their Web site at ***www.vetmed.ucdavis.edu/ceh/BBCDL***, or telephone Dr. Gregory Ferraro at (530)752-6433 (e-mail: glferraro@ucdavis.edu).

Viral diseases of humans and animals are becoming increasingly important to the maintenance of worldwide health. The changing demographics of the horse industry, particularly the international movement of sport performance horses, clearly places horses in an especially high-risk category for both infection and transmission of any new and/or emerging viral disease. With initial funding support provided by Dr. Bernard and Mrs. Gloria Salick, the **Equine Viral Disease Laboratory** was dedicated in April 1999 to facilitate the diagnosis, control, and study of the global spread of viruses that have the potential to cause disease in horses and humans. Subsequent core laboratory support for specific infectious disease research has been provided by the Harriet E. Pfleger Foundation over the past five years. The mission of the Equine Viral Disease Laboratory is to promote equine health by undertaking research on diseases of the horse caused by viruses. Specific objectives are to provide state-of-the-art diagnostic expertise, reagents, and technology dedicated to the horse and to facilitate transfer of this technology and expertise to appropriate partners within this and other universities, in the state government, federal government, and international health organizations.

Under the direction of Dr. N. James MacLachlan, the Equine Viral Disease Laboratory is leading the international effort to develop better diagnostic technology to identify diseases. The laboratory is working to improve vaccines to prevent these diseases and is coordinating efforts to better monitor and control them. It disseminates information on a regular basis and provides a facility that is a global hub for the interaction of scientists involved in the study of disease.

Some major accomplishments since the laboratory's inception include:

- Pioneering work in the characterization of Equine Viral Arteritis (EVA).
- Development of improved assays to expedite accurate diagnosis of EVA infection in horses.
- Development of a new-generation vaccine for immunizing horses against EVA.
- Initiation of comprehensive epidemiologic studies to examine the impact of West Nile Virus (WNV) on horses in California.
- Continued work with molecular studies of WNV to identify key genetic determinants of phenotypic properties, including virulence of field strains and the role of reservoir hosts (mosquitoes, birds) in fostering evolution of WNV in the field.
- Initiation of an extensive study of virus-induced respiratory disease of young Thoroughbred horses in Southern California to determine the precise role of viruses in the occurrence of respiratory disease in yearlings.
- Progress in the development of a vaccine for African Horse Sickness virus.

Future goals for the Equine Viral Disease Laboratory are to broaden diagnostic capabilities through strategic partnering with pre-eminent groups nationally and internationally in order to address every major viral disease of the horse. The laboratory will continue cutting-edge research on viral diseases of the horse that are important to the regional industry. There will be a focus on new diagnostic and immunization technologies, characterization of the epidemiology and pathogenesis of important viral diseases of the horse, and identification of new and emerging viral diseases of the horse.

To contact the Equine Viral Disease Laboratory, visit their Web site at ***www.vetmed.ucdavis.edu/evdl***, or contact Dr. James MacLachlan at (530)752-1385 (e-mail: njmaclachlan@ucdavis.edu).