

Equine Research

UF | College of Veterinary Medicine
Advancing Animal, Human and Environmental Health



UNIVERSITY of
FLORIDA

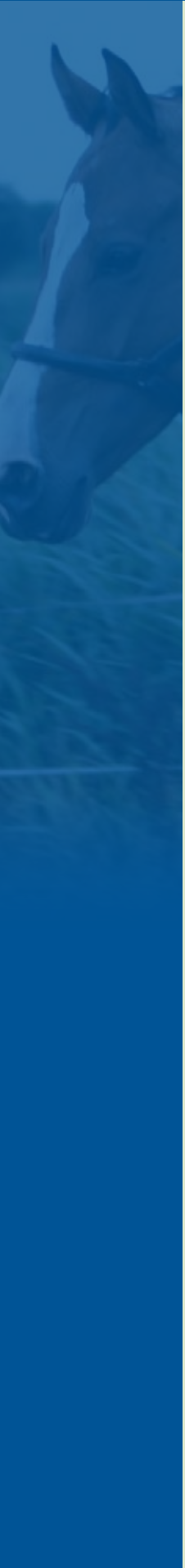


Table of Contents

Introduction..... 1

Equine Program Overview 4

Equine Performance Laboratory 6

Equine infectious disease research and testing program 9

Biomarkers of joint injury in athletic horses 12

Island Whirl Equine Colic Research Laboratory 14

Neonatology 16

Ophthalmology: Preventing blindness in horses..... 18

Equine reproduction 20

Directory22

Gifts.....24



DR. DAVID FREEMAN, DEAN GLEN HOFFSIS AND DR. CHARLIE COURTNEY

College of Veterinary Medicine Introduction

The University of Florida's College of Veterinary Medicine is respected nationally and internationally for its ongoing and well-established commitment to animal, human and environmental health. The state's only veterinary college carries out its mission of education, research and patient care every day in classrooms, in laboratories and in its teaching hospitals.

Research conducted by UF veterinary faculty and their colleagues has supplemented the clinical efforts offered to horse owners through our Alec P. and Louise H. Courtelis Equine Hospital and is an important component of the services and

value provided to Florida's \$2.2 billion horse industry, which has an overall economic impact of \$6.5 billion to the state's economy. The area of equine health and performance is one in which UF has excelled, in large part due to its proximity to Marion County, Fla., the horse capital of the world, with more horses and ponies than any other county in the nation, according to the USDA census.

UF's long history of accomplishment in equine research has been made possible not only through our own faculty — board-certified internists, surgeons, and infectious disease specialists, among others — but also through a number of state and private partnerships as well



DEAN GLEN HOFFSIS

as academic collaborations. This publication provides an overview of the many ways in which these important relationships have contributed to research discoveries and ultimately to horse health and well being.

The lives of many valuable foals have been saved in UF's Equine Neonatal Intensive Care Unit, which was founded in the early 1980s and was the first of its kind to be created in the United States. The UF NICU remains one of an elite group of such units capable of providing this standard of care to mares and foals suffering from a variety of life-threatening medical conditions relating to premature birth and perinatal disease.

The Island Whirl Equine Colic Research Laboratory conducts activities aimed at expanding knowledge about the normal

function of the equine gastrointestinal tract. Gastric ulcers in the adult horse and foal have been a research emphasis in the Island Whirl laboratory for many years and have produced significant findings relating to gastric function and disease.

UF ranks as one of the leading academic institutions in the research of joint disease in horses, both nationally and internationally. Joint disease accounts for 28-42 percent of lameness in horses, which is just

one reason why research into joint diseases such as osteoarthritis is so important. Researchers at UF have been working on new laboratory tests known as biomarkers to measure early changes indicative of joint disease and which can be measured in blood, joint fluid and urine. Our work aims to develop and refine the use of biomarkers of joint injury in horses; to insure early diagnosis before the development of irreversible changes to the joint; to better predict the severity of joint damage; and ultimately to monitor the effects of treatment and preventive measures.

Veterinary faculty working in UF's Equine Performance Laboratory conduct research on the elimination and effects of drugs administered to athletically conditioned Thoroughbred horses. This research promotes

the humane treatment of horses and the fairness of the athletic competition. The laboratory houses a high-speed treadmill and is staffed by experienced horsemen. Since 1996, the state's Division of Pari-Mutuel Wagering has contracted with the college to fund studies of drugs that may be administered to racehorses for therapeutic purposes, or to affect performance. The drugs studied are selected jointly by the directors of the CVM Racing Laboratory, the Division of Pari-Mutuel Wagering and the Equine Performance Laboratory and are chosen based on their regulatory importance.

“Faculty members associated with UF's equine reproduction unit have been positively impacting the horse industry since the college's inception.”

In addition to the research conducted for the Division of Pari-Mutuel Wagering, faculty working in the Equine Performance Laboratory have investigated a broad field of subjects including the pharmacokinetics of drugs, adaptations of horses to exercise,

effects of intense exercise on the immune system, the effects of feed supplements on performance, the effect of acupuncture on lameness and on respiratory function and the use of gene therapy for the treatment of arthritis.

The University of Florida has a long history of clinical expertise and research in equine infectious diseases that has grown into a unique partnership between veterinary specialists and public health specialists at UF's Emerging Pathogens Institute, the Florida Department of Agricultural and Consumer Services and other institutions. UF has the only in-state laboratory for detection of arboviruses and neurotropic equine herpesvirus outbreaks in horses. Research conducted at UF has expanded our knowledge of West Nile virus, Eastern equine encephalitis, Potomac horse fever, equine protozoal myelitis and equine infectious anemia virus.

UF veterinary ophthalmologists, specifically the large animal horse eye team, are considered to be international leaders in continuing education and research and are constantly advancing the medical standards of care for equine eye disease. Clinical service and

education is balanced by a strong research tradition with an extensive bibliography of published research on problems of the horse eye. The UF staff has successfully performed more corneal transplants and corneal amniotic membrane grafts in the horse than any other veterinary hospital in the world. Many other ocular surgical and medical procedures for glaucoma and corneal ulcers have also been studied and developed for horses.

Research in the field of equine reproduction aims to improve horse breeding through a variety of approaches. Faculty members associated with UF's equine reproduction unit have been positively impacting the horse industry since the college's inception. Since that time, significant developments have been made in managing infertility in mares, in understanding and treating placental infections and in improving stallion fertility.

In addition to providing the academic home to equine specialists, the UF College of Veterinary Medicine provides opportunities for the cross-pollination of ideas through interdepartmental collaborations with the goal of improving horse



health through a multi-centered, team-oriented approach. We are proud to showcase the efforts of our talented faculty and express our appreciation for the many individuals, organizations and agencies who have worked with us over the years toward this end.

We would like to acknowledge that many former faculty, graduate students, residents and staff were instrumental in the research presented herein.

Best regards,

Glen Hoffsis, D.V.M., M.S.,
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Equine Research Program Overview



DR. AMANDA HOUSE

Thank you for your interest and support of the University of Florida's College of Veterinary Medicine. The University of Florida is dedicated to providing state of the art medical and surgical care for your horse, teaching the future veterinarians of our state, and doing research with the goals of advancing equine wellness in our state and throughout the world. Equine research at UF is conducted under strict federal and university regulations to ensure the most humane care and welfare of all of our horses. Many of our horses live here for several years and participate in non-invasive studies before they are adopted out or sold to loving homes. All of our horses are maintained on a routine preventative health care program and live on pastures with ample shelter. We sincerely appreciate the essential role of our horses and they are provided exceptional attention and care by all of our staff here. Equine research is critical for new advances in diagnosis and treatment of diseases that can affect horses, as well as other animals and sometimes even people. When you support the University of Florida's Equine Research Program, you are a contributor to the health and wellness of the horse.

DID YOU KNOW?

- All research at the University of Florida has the ultimate goal of improving the health and care of horses throughout our state.
- From 2000-2008, equine researchers at the University of Florida obtained more than \$7.5 million dollars in funds from granting organizations.
- UF equine faculty published more than 850 scientific abstracts, book chapters, and peer-reviewed publications on their work from 2000-2008.

- From 2000 to the present, UF faculty have performed more than 800 scientific, professional, and extension presentations to veterinarians, industry professionals, and horse owners.
- Research performed at the University of Florida on different treatments for foal pneumonia caused by *Rhodococcus equi* is changing the treatment of this infection throughout the country and the world.
- Our researchers have performed multiple studies which revealed the appropriate dose and use of antibiotics in the foal, a discovery that has improved the treatment and care of foals throughout the state and county.
- The research at UF resulted in new information on treatment and prevention of stomach ulcers in adults and foals.
- Research at UF has demonstrated the efficacy of pain management strategies in the horse.
- We have discovered new information to explain how and why foals develop R. equi pneumonia.
- Our researchers have provided the best ways to test for adequate transfer of antibodies in colostrum from the mare to the foal through studies on our research foals.
- We have discovered new techniques for improving survival after colic surgery.
- We have improved patient care at veterinary hospitals throughout the world by studying the best ways to monitor blood pressure and blood flow to different organs in foals in intensive care units.
- We have learned how to accurately diagnose anhidrosis (non-sweating) in horses.
- Studies performed at UF have helped determine the best therapy for EPM in horses.
- Our studies have shown the best drugs to use on foals with low blood pressure in intensive care units.
- Our studies have demonstrated how many different drugs work in the foal and helped improve care of the sick foal.
- Researchers at UF confirmed that Mare Reproduction Loss Syndrome (MRLS) does occur in Florida and is a likely cause of abortion in mares.

- Researchers at UF discovered *Nocardioform* placentitis in a Florida-bred mare, formerly isolated only in central Kentucky.
- Research in UF's Equine Soundness Program has demonstrated markers for the diagnosis and monitoring of progression of osteoarthritis. Some of our tests have greater than 90 percent accuracy in predicting the presence or absence of joint injury.
- UF's Racing Laboratory runs more than 100,000 samples from horses and dogs in pari-mutuel competition per year.
- Studies at UF have helped determine the effects of more than 40 different drugs on racing performance in Thoroughbreds.

Please read more about the University of Florida's Equine Research Program on the following pages. We appreciate your support in continuing this critical

“Equine research is critical for new advances in diagnosis and treatment of diseases that can affect horses, as well as other animals and sometimes even people.”

research for our state and horses everywhere. Finally, we would also like to thank Dr. Eleanor Green for her support of the equine research program.

Sincerely,

Amanda M. House, D.V.M., D.A.C.V.I.M.
Assistant Professor
Department of Large Animal Clinical Sciences
Director, Equine Research Program



Equine Performance Laboratory

The Equine Performance Laboratory at the University of Florida was established by Dr. Woody Asbury in 1994. The state Legislature subsequently provided funding to the Florida Division of Pari-Mutuel Wagering for a contract with UF. With this funding, the College of Veterinary Medicine built a facility and began research on the elimination and effects of drugs administered

to athletically conditioned Thoroughbred horses. The facility houses a high-speed treadmill and is staffed by experienced horsemen. In 1995, faculty members from the veterinary college conducted studies of acepromazine on 12 horses in this laboratory.

Since 1996, the Division of Pari-Mutuel Wagering has entered into an annual contract with the college to fund studies of drugs that may be administered to racehorses for

therapeutic purposes, or to affect the outcome of a race. The drugs to be studied are selected jointly by the directors of the CVM Racing Laboratory, the Division of the Pari-Mutuel Wagering, and the Equine Performance Laboratory. These drugs are selected based on their regulatory importance. Drugs selected for investigation include: common medications that may have performance altering potential, but for which

the elimination time is unknown; medications for which the Division of Pari-Mutuel Wagering wishes to establish rules to control use in racing horses; drugs for which the Racing Laboratory is improving detection methodology; and any other medication or substance of regulatory importance.

In addition to the research conducted for the Division of Pari-Mutuel Wagering, faculty in the Equine Performance Laboratory have investigated a broad field of subjects including the pharmacokinetics of drugs, adaptations of horses to exercise, effects of intense exercise on the immune system, the effects of feed supplements on performance, the effect of acupuncture on lameness and on respiratory function, and the use of gene therapy for the treatment of arthritis. Funding for these studies has come from many sources, including the Racing Medication and Testing Consortium (the RMTTC), the American Quarterhorse Foundation, the Morris Animal Foundation, University of Florida Development funds, private contributions to the university supporting horse research, and the Pari-Mutuel Wagering Competitive grants fund. The Equine Performance Laboratory has obtained nearly \$4.5 million in research funding since its establishment in 1994.

The goal in these studies and all the research undertaken by the Equine Performance Laboratory is to investigate therapeutic agents

and clinical problems in athletic horses and to promote the humane treatment of horses and the fairness of athletic competition.

Collaboration with other faculty at the University of Florida has contributed greatly to the productivity of the Equine Performance Laboratory. Chief among the collaborators has been the director of the Florida Racing Laboratory, Dr. Rick Sams, as well as his predecessors, Dr. Cindy Cole and Dr. Ian Tebbett.

These and other collaborations with world-renowned faculty from other universities, along with consistent funding from the Florida Division of Pari-Mutuel Wagering have made the Equine Performance Laboratory a national resource for equine drug and exercise research. The Equine Performance Laboratory has produced more than 75 reports, publications, and presentations on equine exercise and equine pharmacokinetics. Eight graduate students and 16 residents in advanced clinical studies have completed research projects or have received clinical training in the Equine Performance Laboratory.

In addition to research functions, the Equine Performance Laboratory has an important clinical function. The veterinarians at the UF Veterinary Medical Center routinely examine

“In addition to research functions, the Equine Performance Laboratory also has an important clinical function.”

horses using the high-speed treadmill and have examined over 500 horses for upper airway disease or other performance-limiting problems. These horses are privately owned and are admitted to the VMC for evaluation of poor exercise performance. Most suffer from reduced performance due to upper respiratory problems. Endoscopy performed while a horse is exercising on the treadmill allows clinicians to identify malfunctions of the airway such as palate displacement, which is not obvious in a standing horse.

Some of the techniques developed in the Equine Performance Laboratory to conduct research studies will be clinically





useful as well. A technique has been developed to perform pulmonary function testing on horses to study the pulmonary effects of bronchodilator drugs. When adapted for clinical use, the technique will be used to determine if a horse has inflammation in the airways of the lungs, a condition that can greatly reduce performance.

The Equine Performance Laboratory has investigated 46 drugs since 1994. Those investigations have been undertaken for a variety of reasons including:

- To determine the potential of the drug to alter racing performance
- To aid in the setting of threshold concentrations in the testing laboratory
- To determine elimination time for therapeutic drugs

“The Equine Performance Laboratory has investigated 46 drugs since 1994.”

- To determine duration and intensity of drug effects
- To improve an existing analytical technique or develop a new method of analysis

Studies on novel treatment methods have been undertaken as well. Acupuncture studies indicate that lameness can be improved by the appropriate acupuncture treatment. Current studies are investigating the use of

acupuncture to relieve the distress and improve the performance of horses with inflamed airways in their lungs.

The use of gene therapy to control the inflammation of arthritis has been investigated in a study conducted in the Equine Performance Laboratory in collaboration with Dr. Steve Ghivizanni of the Department of Orthopedics in the College of Medicine. The results of this study indicated that gene manipulation could cause the cells of the joint lining to increase their production of anti-inflammatory proteins. The final development of this technique could lead to a treatment that does not involve chemicals like drugs but uses the horse's own internal mechanisms to control inflammation and promote healing. Further funding is being sought to complete this very promising and exciting research.

Equine infectious disease research and testing program

The University of Florida has a long history of clinical expertise and research in equine infectious diseases that has grown into a unique partnership between veterinary specialists, public health specialists at UF's Emerging Pathogens Institute, the Florida Department of Agricultural and Consumer Services, the University of South Florida and Florida Gulf Coast University. Veterinarians and staff who work in the departments of Large Animal Clinical Sciences and Infectious Diseases and Pathology in the College of Veterinary Medicine form a unique leadership team with multiple disciplines across the UF campus and the state. The goal is to expand our collective understanding of the impact of equine infectious diseases on the horse industry. Our faculty, staff, and students are committed to improving the current state of knowledge to further advance the discipline of equine infectious diseases by conducting both basic and an applied research in equine immunology and their pathogens.

Infectious disease research at UF has been funded by the United States Department of Agriculture, the Southeastern Regional Center for Bioterrorism, the Southeastern



DR. MAUREEN LONG

Regional Center for Biodefense (Department of Defense), the Southeastern Regional Center for Emerging Diseases and Biodefense (National Institutes of Health), Florida's Pari-Mutuel Trust Fund, and the Florida Derby Gala.

Industry support has included Intervet/Azko-Nobel, Merck-Merial Student Scholarships, IDEXX Student Scholars, Boehringer-Ingelheim, and Hennessey Research. Support specifically from Florida's Pari-Mutuel Trust



Fund and the USDA allowed the college to establish the only in-state laboratory for detection of arboviruses and neurotropic equine herpesvirus outbreaks in horses. Research performed at the College of Veterinary Medicine has expanded our knowledge of West Nile Virus (WNV), Eastern Equine Encephalitis (EEE), Potomac Horse Fever (PHF), Equine Protozoal Myelitis (EPM), and Equine Infectious Anemia virus (EIA).

The primary goal of our equine infectious disease testing program is to enhance identification of arboviruses and other emerging diseases in the horse and develop a plan for communication of risk to human beings, equine industry stakeholders, and the horse owning public. Continued and enhanced surveillance of horses in the Southeast is important for three reasons. First, arboviruses that are presently known to cause disease in Florida horses are underreported.

Second, the recent hurricanes within the Atlantic Ocean and Gulf of Mexico may result in increased encroachment of epidemic arboviruses from Central and South America. Third, only 10-30 percent of horses meeting the case definition of WNV and EEE are confirmed, leaving many of these cases open which are likely caused by other arboviruses. The testing component of this program relies on rapid, state-of-the art pathogen

identification techniques which have allowed numerous small outbreaks of neurotropic EHV-1, EEE, and WNV to be diagnosed, resulting in quick and efficient mitigation.

The primary goal of our equine infectious disease research program is to broaden and deepen our understanding how these agents cause illness in horses in order to develop earlier detection methods and better treatments. Once a horse actually demonstrates clinical signs of infectious neurologic disease, catastrophic injury to spinal cord and brain may likely have occurred precluding normal life and top athletic performance. Currently there are no treatments for encephalitis caused by WNV, EEE, or neurotropic EHV-1, and the fatality rates for each are 45 percent, 95 percent, and 50 percent, respectively. Although vaccines are available for WNV and EEE, recent evidence indicates that very young vaccinated horses are still susceptible to EEE. No preventative strategy is available at all for either neurotropic EHV-1 or EPM.

“The primary goal of our equine infectious disease testing program is to enhance identification of arboviruses and other emerging diseases in the horse and develop a plan for communication of risk to human beings, equine industry stakeholders, and the horse owning public.”

The largest hindrance to the development of therapies and diagnostics for equine diseases is due to gaps in our knowledge at the basic genetic and protein level in the horse. Collaborative work in the College of Veterinary Medicine with the McKnight Brain Institute is addressing the large gap in equine science in order to develop investigatory platforms for understanding the pathways that regulate encephalitis (caused by EEE virus, WNV and EPM in the horse). Specifically, through high performance gene sequencing here available at the UF Interdisciplinary Biotechnology Core Research Laboratory, microarray and biomarker technology has been developed to dissect the inflammatory cascade of many eye and neurological diseases.

SUMMARY OF IMPACT ON THE FIELD OF EQUINE INFECTIOUS DISEASES

- We now are able to provide efficacy testing of all currently licensed vaccines against WNV in which we were able to determine the level of protection against WNV induced disease. Prior to our recent efforts, the level of efficacy for marketing of these vaccines relied only on induction of antibody, not protection against actual disease.
- We are now capable of providing safety, efficacy, and duration-of-immunity testing of a novel chimeric vaccine against

WNV that does not require an adjuvant and only one yearly booster in horses. This same vaccine platform is currently being tested for use in humans for prevention of WNV.

- Our laboratory ensures determination of the sensitivity, specificity and accuracy of the commonly used tests for diagnosis of WNV using serum and CSF as well as development of new testing platforms for surveillance of WNV and EEE virus.
- We have conducted a study of the ecology of Florida horse farms to determine factors which promote outbreaks of mosquito-borne encephalitis. We also were able to perform an industry analysis of the cost of the 2001 WNV outbreak in Florida.
- Our UF researchers have performed a sequencing of the equine brain with identification of more than 1000 novel genes not described in the horse genome project.
- Our UF team also is responsible for developing the first brain specific microarray for use in the horse. This tool will allow us to dissect the mechanisms of brain and spinal cord injury in a variety of infectious and non-infectious neurologic diseases.
- Collaborative studies with researchers at the Department of Animal Science, Texas A&M University have identified genes that control innate resistance to West Nile virus.

- We have established the Emerging Diseases/Arbovirus Research and Test (EDART) Program at the University of Florida College of Veterinary Medicine as a core equine diagnostic facility.

Finally, a critical mission is the education of veterinarians and researchers. This program has provided mentorship and support to several Ph.D. and master's level graduate students. Thus far, our graduate students have been highly successful in obtaining positions of leadership, teaching and research in other universities and at the CDC. This program has also supported projects for 12 veterinary students in fulfillment of the requirements of their DVM degrees.





Biomarkers of joint injury in athletic horses



A 1998 USDA study estimated that the total cost of lameness in U.S. horses was \$678 million to \$1 billion. This study found that colic was a distant second to lameness in terms of annual incidence, veterinary costs, and lost days of use. The authors of that

report concluded that lameness must be selected as an area of emphasis for future study in horses. Joint disease accounts for 28 percent to 42 percent of lameness in horses.

This emphasizes the importance of joint diseases, such as osteoarthritis. Diagnosis is often made when osteoarthritis is

advanced. There is no cure and treatments are symptomatic. Finding better ways to diagnose and treat joint disease is critical to reducing this impact. Osteoarthritis is difficult to diagnose in its early stages when progression of the disease could potentially be reversed. However, new laboratory

tests called “biomarkers” can measure early changes that are specific for joint tissues and can be measured in the blood, joint fluid, and urine. Researchers at the University of Florida College of Veterinary Medicine have been working on biomarkers of joint injury in horses since 1995.

UF’s work has been funded by the Pari-Mutuel Wagering Trust Fund, the U.S. Equestrian Federation, the American College of Veterinary Surgeons, Merck-Merial, Pfizer, and USDA Animal Health Funds. Longterm goals in our research at UF are to develop and refine the use of biomarkers of joint injury in horses: (1) to insure early diagnosis before development of irreversible changes to the joint; (2) to predict the severity of damage to a joint; and (3) to monitor the effects of treatment and preventative measures.

SUMMARY OF IMPACT OF OUR RESEARCH ON THE SOUNDNESS OF HORSES

- Our studies are the first to establish a correlation between joint injury biomarker concentrations and severity of joint injury in horses (assessed by radiographic and arthroscopic scores).



DR. MURRAY BROWN

- Our studies show that biomarkers of joint injury are useful in determining whether a joint is injured or normal.
- Our major research contribution to the musculoskeletal soundness of athletic horses would be our development and validation of biomarkers for the diagnosis and monitoring of progression of osteoarthritis. Some of our tests have greater than 90 percent accuracy in predicting the presence or absence of joint injury.
- The expected impact of this research is preservation of soundness and well being of all horses, including promotion of safe use of athletic horses. We expect reduced loss of use of horses as a result of earlier diagnosis of joint disease and an objective means to test joint therapies, thus identifying appropriate, effective therapeutic

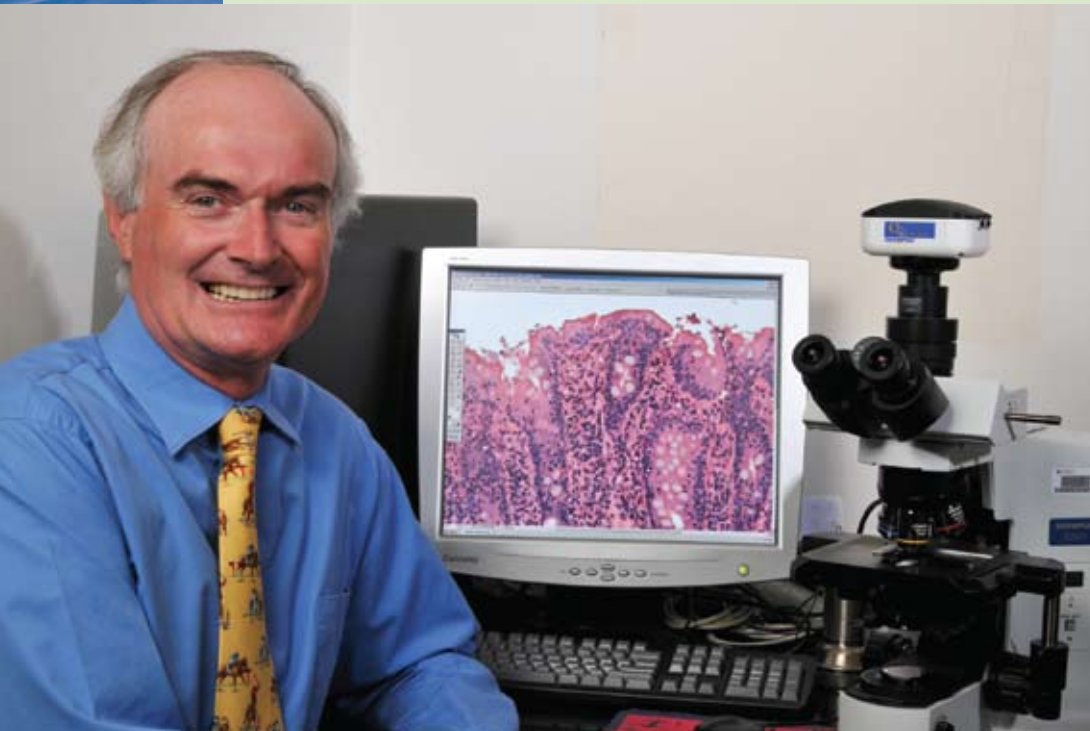
and management practices. This will in turn reduce economic losses caused by joint disease in all segments of the horse industry.

The University of Florida ranks as one of the leading institutions on joint disease biomarker research. We have disseminated our findings in scientific journals and at international conferences.

Our work has yielded information that is not only applicable to horses and other animal species, such as dogs, but also to humans. As a result, our work has generated considerable interest at several international congresses on human osteoarthritis. This interaction with our physician counterparts has been a great asset to our research program and has facilitated the exchange of information between the veterinary and human research arenas.



Island Whirl Equine Colic Research Laboratory



DR. DAVID FREEMAN

The Island Whirl Equine Colic Research Laboratory (IWECL) was endowed in 1988 by Mr. and Mrs. William Harder to honor their highly regarded Thoroughbred stallion, "Island Whirl." Activities of this laboratory are directed at expanding our knowledge about normal function of the equine gastrointestinal tract and ways in which we can improve treatment and prevention of colic in horses. Dr. Al Merritt was instrumental in the establishment of this lab.

The IWECL endowment maintains a well-equipped laboratory complex. It also provides competitive funding for small grants directed at colic-related research by residents and faculty within the University of Florida College of Veterinary Medicine and helps to attract extramural grant support on colic-related issues. Numerous publications and abstracts have been generated from research projects done within the laboratory. Perhaps what we have accomplished recently is best represented by our contributions

to the 9th Equine Colic Research Symposium in Liverpool, England, in June 2008, when 20 of the total 101 presentations were given by faculty and graduate students from the IWECL.

A very exciting phase in our colic research program was initiated by Misdee Wrigley, who established an endowed fellowship in equine colic research in honor of her mother, Deedie Wrigley-Hancock. Four graduate students have completed their programs supported through the lab or the Wrigley-Hancock Fellowship, and we continue to maintain an active graduate program.

The lab also hosts numerous foreign scholars who participate in ongoing projects. Current faculty members that lead the team of scientists in the IWECL are Dr. David Freeman (Director), Dr. Chris Sanchez, Dr. Alison Morton, and Dr. Al Merritt.

ACCOMPLISHMENTS

Gastric ulcers in the adult horse and foal have been a focus for research in the IWECL for many years and have produced some of the most significant findings on gastric function and diseases in the horse. Intestinal studies have focused on tissue changes in the horse's colon that could affect

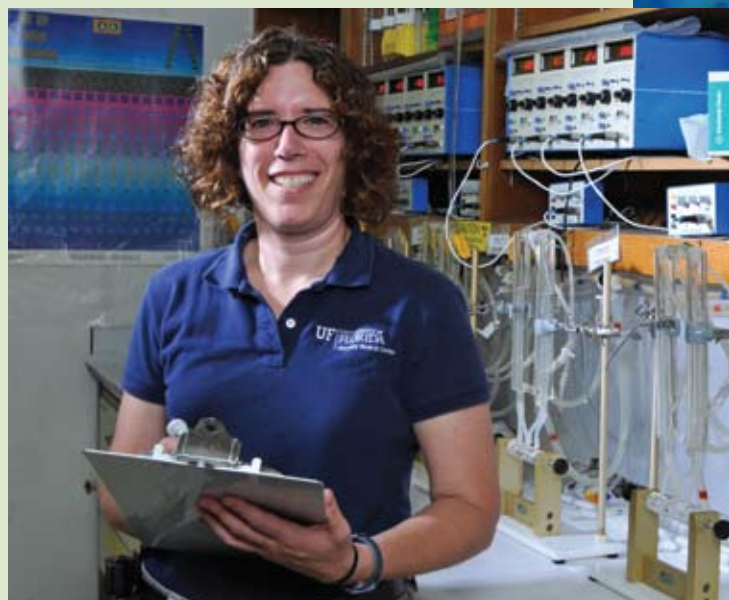
recovery and repair of the colon lining after some of the more deadly forms of colic. Other studies explored effects of commonly used painkillers on intestinal function and mild intestinal discomfort. Examples of significant findings are as follows.

- Abrupt changes in a horse's environment by switching it from stall to paddock or vice versa are not likely to increase gastric acidity and increase risk of ulcers, contrary to what previous studies would suggest. However, acid exposure increases in the top part of the stomach during the early morning (from 1 a.m. to 9 a.m.), regardless of the environmental situation. This is the first evidence that horses experience a circadian pattern in gastric acidity. These findings also mean that other recognized causes of high acid output should be avoided and antiulcer medications should be given during those hours.
- Repair of mucosa (lining) following an artificially created twist in the colon involves cellular responses during the process that could be altered to hasten recovery.
- In the same colon twist model, the commonly used anti-inflammatory drug, flunixin meglumine (Banamine®), does not impair recovery of colonic mucosa from loss of blood flow (ischemia). This critical discovery is the opposite of what has been reported in horse small intestine, and supports continued use of this valuable painkiller for horses with colic.
- We have learned that an inflammatory cell, the

eosinophil, that has received little attention to now, but which is abundant in the lining of the horse's colon, might play the most critical role in inflammation in the colon after we correct a colon torsion (twist). If we understand factors that control this cell's activity and migration, we could use this information to enhance recovery from some of the deadliest forms of colic.

- Research at the IWECLRL was the first to demonstrate that increased intra-abdominal pressure during intense exercise in horses causes gastric compression, pushing acidic contents into the upper region of the stomach. This finding could explain why horses in intensive training programs (race training) could be prone to ulcers in this vulnerable site.
- Hospitalized critically ill foals differ from healthy foals because they have alkaline and not acid stomach contents, which means that the widespread use of protective acid-blocking agents is unnecessary in critically ill foals.
- Studies into the efficacy of omeprazole, related drugs, and other compounds as means of acid suppression in adult horses and foals have provided guidelines that have been widely adopted for treatment of gastric ulcers in adult horses and foals.
- Frequent feeding of neonatal foals through normal nursing behavior can lower gastric acidity and, by inference, the risk of gastric ulcers.

- A series of studies on normal gastric function have provided information on how the stomach responds to different meals and the interplay between gastric and small intestinal function, all of which could help us understand mechanisms that contribute to gastric ulcer formation.
- An important achievement by scientists in the IWECLRL is the development of humane, pain-free models to study a disease such as colic, and producing information that is relevant to the clinical case. For this purpose, studies have been performed on specially trained and instrumented conscious horses and on tissue taken from horses that have been humanely euthanatized after an anesthetic period during which the disease was reproduced. Isolated tissues have been kept alive in an artificial environment to allow study of function and repair over periods of interest.



DR. CHRIS SANCHEZ



Neonatology research



The discipline of equine neonatology was born at the University of Florida in a unique partnership between veterinary specialists and human neonatologists at the UF Health Science Center. Veterinarians and staff who work in the Hofmann Equine Neonatal Intensive Care Unit are proud to be associated with the most advanced neonatology center in Florida and one of the leading institutions in equine neonatal care worldwide. Our faculty and staff are committed to improving

the current state of knowledge to further advance the discipline of equine neonatology by conducting both basic and an applied research in equine neonatology.

Neonatology research at UF has been funded by the Morris Animal Foundation, Florida's Pari-Mutuel Trust Fund as well as the Florida Thoroughbred Breeders' and Owners' Association. In fact, support from the association allowed the college to establish a breeding herd of 20 mares that provide foals each year for research. Once the research is completed,

the foals are adopted through an independent process overseen by the Alachua County Humane Society. Knowledge acquired from our herd of research mares and foals has been directly applied to improving the care of equine neonates. Each research project performed addresses a clinically relevant problem. The results of these studies have already modified our approach to monitoring or treating critically ill foals.

A major focus of the neonatology research program is to study a bacterial agent named *Rhodococcus equi*. *R. equi* is one of the most important causes of pneumonia in foals less than 5 months of age and has a major financial impact on the horse industry. The disease is devastating on many horse-breeding farms with sometimes up to 60 percent of the foal crop contacting the disease. On such farms, cost associated with veterinary care, early diagnosis, long-term therapy, and mortality of significant numbers of foals is exorbitant.

In addition to significant immediate costs, *R. equi* pneumonia has a long-term detrimental effect on the equine industry because foals that recover from the disease are less likely to race as adults. Our research on *R. equi* has contributed to a better understanding of why *R. equi* causes disease in foals but not in adult

horses. Our research has also led to improved approaches for diagnosis, treatment, and control of infection caused by this devastating pathogen. Other prolific areas of research include the use of antimicrobial agents in foals, treatment of gastric ulcers, and the discovery of better methods for monitoring critically ill equine neonates. A few examples of our research contributions are provided below.

SUMMARY OF IMPACT ON THE FIELD OF EQUINE NEONATOLOGY

- Our research has led to development of more effective treatments for pneumonia caused by *Rhodococcus equi*.
- We have done studies which validated the use of multiple antibiotics in the foal. These antibiotics are now widely used by equine practitioners.
- The research at UF resulted in new information on treatment and prevention of stomach ulcers in the foal.
- We have discovered new information to explain how and why foals develop *R. equi* pneumonia.
- We have determined the best ways to test for adequate transfer of antibodies in colostrum from the mare to the foal.
- We have improved patient care at veterinary hospitals throughout the world by studying the best ways to monitor blood pressure and blood flow to different organs in foals in intensive care units.
- Our studies have shown the best drugs to use on foals with low blood pressure in intensive care units.
- We have confirmed that Mare Reproduction Loss Syndrome (MRLS) does occur in Florida and is a likely cause of abortion in mares.

The University of Florida ranks as one of the leading academic institutions in foal research. Dissemination of our results through publication in peer reviewed scientific journals and presentations at veterinary conferences has ensured that our colleagues throughout the world can also benefit from our findings.

“The University of Florida ranks as one of the leading academic institutions in foal research.”



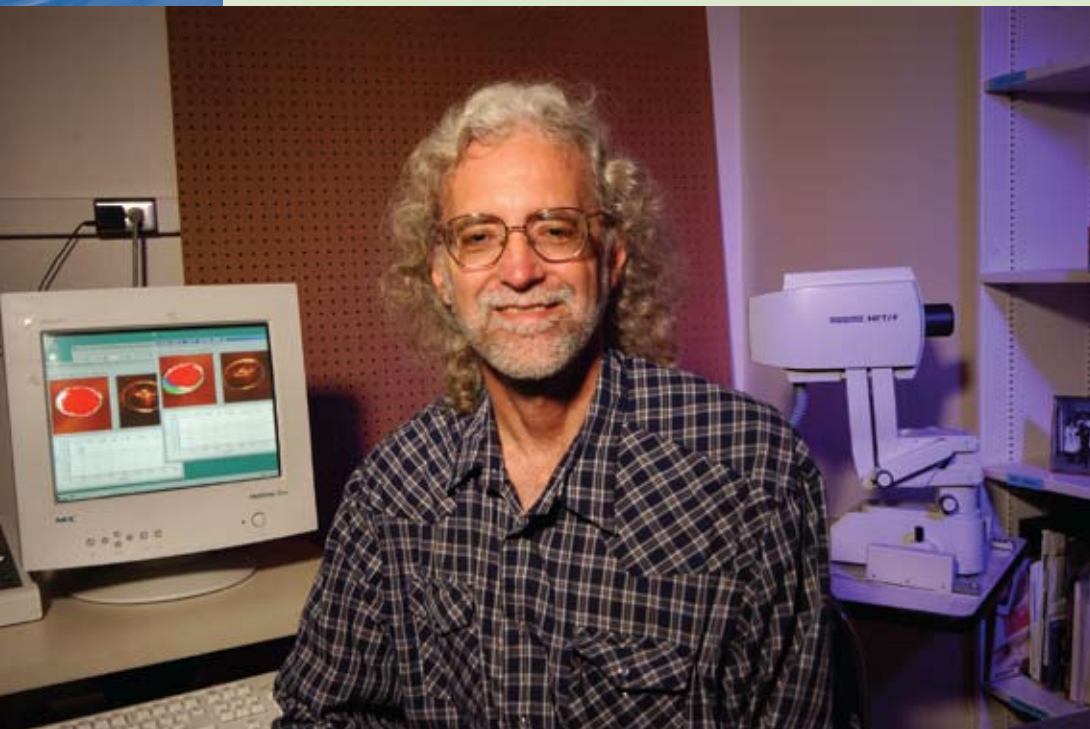
In addition to the neonatology research, the presence of the breeding herd on the University of Florida property has led to two very important scientific discoveries. Researchers were able to confirm Mare Reproductive Loss Syndrome (MRLS) does occur in Florida and is likely to be a reoccurring cause of abortion in mares. Farm owners learned the need to screen their farms for the presence of cherry trees to eliminate the Eastern Tent Caterpillar.

The second advancement was the discovery of *Nocardioform* placentitis in a Florida-bred mare which until now has only been isolated from mares in central Kentucky.

Much of this work was performed by Dr. Steeve Giguère, who was also instrumental in developing and maintaining the breeding herd. The UF College of Veterinary Medicine, therefore, is very grateful to Dr. Giguère and acknowledges his contributions to this piece as well as his tremendous achievements in advancing equine neonatal research.



Preventing blindness in horses



DR. DENNIS BROOKS

The Large Animal Ophthalmology Service at the University of Florida College of Veterinary Medicine has a reputation for excellence in eye care for horses. Currently led by Dr. Dennis Brooks, who serves as service chief, the ophthalmology team also includes faculty members Dr. Kathy Barrie and Dr. Caryn Plummer.

The Large Animal Ophthalmology Service is one of the busiest in the world. This group trains a large number of veterinary

residents as well as veterinary students, and accepts referrals from the nearby horse community of Ocala in Marion County as well as from the entire state of Florida, parts of southern Georgia and Alabama. Our service even sees horses from as far as Kentucky, Texas, Minnesota, Oregon, New Hampshire and Vermont. Our ophthalmology group accepts the difficult horse eye cases that are turned away elsewhere, and consistently achieves impressive outcomes in horses with very serious eye problems.

Members of our large animal “horse eye team” are considered to be international leaders in continuing education and research, constantly advancing the medical standards of care for equine eye disease. Clinical service and education is balanced by a strong research tradition with an extensive bibliography of published research on problems of the horse eye. The UF staff has successfully performed more corneal transplants and corneal amnionic membrane grafts in the horse than any other veterinary hospital in the world. Many other ocular surgical and medical procedures for glaucoma and corneal ulcers have also been studied and developed for horses.

MEDICAL CARE

Regardless of the problem, each horse gets the same level of attention and degree of clinical oversight. This synergy of collaboration has often resulted in innovative treatment options for many horses with severe eye diseases. Referring veterinarians are contacted by phone during the examination, and updated on the case and treatment plan. Discharge instructions are detailed. If a recheck is needed, the appointment is generally made before discharge.

“Members of our large animal ophthalmology team are considered to be international leaders in continuing education and research.”

We attempt to always maintain a friendly atmosphere in order to give the clients top-level professional and personal treatment for their horses. We are also very sensitive to managing complex problems within the constraints of the parent hospital or farm.

MICROSURGERY

Serious eye problems like infected ulcers, stromal abscesses and periocular tumors require hospitalization, and the University of Florida has a very large facility to deal with horses with severe types of eye problems. Each patient is examined daily in the same manner as the outpatients. Inpatient exams are a group effort involving senior clinicians, residents, and the fleet of students and visitors on the service that day.

Deep lamellar endothelial keratoplasty (partial thickness corneal transplants) is an innovative microsurgery technique developed at UF for horses with corneal stromal abscesses. Corneal stromal

abscesses were a common cause of blindness in horses prior to development of this surgery. Penetrating keratoplasty (full thickness corneal transplant) is utilized for deep corneal ulcers in horses.

The equine ophthalmology group at UF has pioneered the use of double amnionic membrane transplants for successfully treating horses with catastrophic corneal disease. Cataract and glaucoma surgery in foals and adult horses is also being performed. The corneal, glaucoma and cataract surgeries are performed by Drs. Brooks, Barrie and Plummer, and are generally assisted by their team of residents. Each procedure requires a marvel of skill, technology and experienced surgical judgment and economy. The most involved procedures can take up to four hours to complete.

Each horse that has complex eye surgery is generally hospitalized for several days and has a subpalpebral lavage system installed in the eyelid of the operated eye. Each lavage treatment involves injection of a small quantity of topical drug into the tube followed by a bolus of air to propel the medication onto the globe. The next medication is administered in a similar fashion a few minutes later. Postoperative patients and intense medical cases receive up to six sight saving medications through the lavage tube at a frequency of six to 12 times a day.

RESEARCH ACTIVITIES

Research in eye problems of horses at present at the University

of Florida College of Veterinary Medicine includes the study of:

- Ophthalmic antimicrobial combinations
- Corneal fungal infections
- Deep endothelial lamellar keratoplasty
- Deep anterior lamellar keratoplasty
- Corneal transplant rejection
- Tear film protease activity
- Antiprotease therapy
- Amnionic membrane grafting
- Fibrin bioadhesives
- Role of ocular biofilms in horses
- Phacoemulsification cataract surgery in horses
- Glaucoma endolaser therapy





Research in equine reproduction at UF



North central Florida has a rich history for producing quality horses of all breeds. The Equine Reproduction Service at the University of Florida has been intimately involved with advancements in the horse industry since the college's inception of the college more than 25 years

ago. Since that time, significant developments have been made in managing infertility in mares, understanding and treating placental infections and improving fertility of stallions. Research in equine reproduction at the University of Florida has been funded by the Grayson Jockey Club Research Foundation, Florida's

Pari-Mutuel Trust Fund as well as the American Quarter Horse Association and private industry. Results from our studies have changed our treatments of mares during the breeding period and pregnancy, as well as the way we evaluate stallion fertility. Examples of our research contributions to the equine industry are listed below.

SUMMARY OF IMPACT ON THE FIELD OF EQUINE REPRODUCTION

- Our studies have shown that several important drugs administered to pregnant mares cross the placenta and are distributed to the developing foal.
- We have shown that mares with placental infections are more likely to deliver live foals after treatment using trimethoprim sulfa, pentoxifylline and Regumate™.
- Novel methods for administering Regumate™ have been tested at UF with promising results. These methods can directly reduce owner exposure to this product as well as the need to administer it on a daily basis.
- Work in our laboratories has shown that about 50 percent of mares treated for placentitis will continue to have bacteria in their uterus after delivery. Follow up care for these mares is important for future breeding success.
- Research at UF has revealed the presence of several proteins in stallion semen that can affect fertility.
- Semen-related proteins show promise for improving fertility of semen that is used fresh or after freezing and cooling.
- Using special ultrasound equipment, studies from UF have shown that altered blood flow in stallion testes can affect sperm quality.



DR. MALGORZATA POZOR

- Additional ultrasonographic studies in stallions have shown that season, housing in the vicinity of stallions and some drugs can affect sperm production.
- Working collaboratively, the reproduction and medicine services confirmed that Mare Reproduction Loss Syndrome (MRLS) as well as nocardioform placentitis occur in Florida and are likely causes of abortion in mares.

Faculty at the University of Florida are committed to excellence in both clinical and research aspects of equine reproduction. Results from our studies have been widely distributed to the veterinary and horse-owning public through publications and presentations. While results from our studies are both basic and clinical in nature, our ultimate goal is to improve horse breeding.



DR. MARGO MACPHERSON

The University of Florida wishes to acknowledge Dr. Mats Troedsson for his contributions to much of this research in equine reproduction.



Key Faculty Engaged in Equine Research



Jeffrey Abbott
Anatomic Pathology



Kathleen Barrie
Ophthalmology



Dennis Brooks
Ophthalmology



Murray Brown
Surgery



Patrick Colahan
Surgery
Equine Performance



Charles Courtney
Associate Dean
Research & Graduate
Studies



Lisa Farina
Anatomic Pathology



David Freeman
Interim Chair, Large
Animal Clinical Sciences
Surgery



Ellis Greiner
Parasitology



John Harvey
Interim Executive
Associate Dean
Clinical Pathology



Jorge Hernandez
Epidemiology



Amanda House
Extension, Medicine



Maureen Long
Infectious Diseases



Robert MacKay
Medicine



Margo Macpherson
Reproduction



Rosanna Marsella
Dermatology



Carolina Medina
Acupuncture



Luisito Pablo
Anesthesiology



Caryn Plummer
Ophthalmology



Malgorzata Pozor
Reproduction



Sheilah Robertson
Anesthesiology



Richard Sams
Racing Laboratory



Chris Sanchez
Medicine



Dana Zimmer
Medicine

Not pictured are Ali Morton (Surgery), Michael Porter (MEDS), Andre Shih (Anesthesia); Huisheng Xie (Acupuncture) and Matt Brokken (Surgery, Lameness).



Gift opportunities

The UF College of Veterinary Medicine recognizes the need to advance animal, human and environmental health through research programs that generate new knowledge, both basic and applied. The college's major strengths in the area of equine health target known health problems such as gastrointestinal illness and lameness, as well as emerging diseases through a variety of scientific approaches. At UF, we are committed to support the nation's need to advance the career development of veterinarians while simultaneously working in our teaching hospitals and in scientific laboratories to improve every aspect of horse health.

To further these efforts, support from the private sector is necessary.

Ways you can help

Outright gifts: Most charitable gifts are made when you write a check to fulfill a pledge, be it a one-time gift or a pledge paid over a period of years. Other types of outright gifts include gifts of stock, bonds or real estate, some of which may have important tax advantages for you, the donor. Checks should be made payable to the University of Florida Foundation, Inc., a qualified charitable organization under section 501 ©3 of the Internal Revenue Code. Reference Fund F016151.

BEQUEST GIFTS:

You may want to consider including a provision in your will for the benefit of the UF College of Veterinary Medicine

ONLINE GIFTS:

To make an online donation to the Equine Research Endowment Fund, go to:

www.uff.ufl.edu/OnlineGiving/FundDetail.asp?FundCode=016151

For more information about endowment funds, estate gifts or other methods of giving to benefit equine research at the college, please contact:

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For more information about equine research at the UF College of Veterinary Medicine, please contact:

Large Animal Clinical Sciences	352-392-2212
Alec P. and Louise H. Courtelis Equine Hospital/ Veterinary Medical Center	352-392-2229
Equine Extension	352-392-2212
Office of the Dean	352-392-2213
Development and Alumni Affairs	352-392-2213

