Research Report 2010

Improving the Health and Well-being of the Horse

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Maxwell H. Gluck Equine Research Center
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The downturn in the global economy has affected the equine industry, resulting in challenging times for horse owners, breeders, equine veterinarians and everybody else in the equine community. The Gluck Equine Research Center is not an exception as we have adjusted our operation to manage budget cuts and devalued endowments without affecting our commitment to improving the health and well-being of horses through research. We have focused our efforts to minimize the effect of a tight budget on the research productivity from scientists at the Gluck Center and to further position the Gluck Center as a premier equine research center even during this difficult time.

Thanks to our committed faculty and staff, the Gluck Center had one of its more productive years ever. A few of the many accomplishments of scientists at the Gluck Center in 2010 include: identification of a potential stem cell for articular cartilage within joint tissue; development of new diagnostic tests for equine protozoal myeloencephalitis (EPM), equine influenza, equine infectious anemia, *Streptococcus equi* and *Leptospira interrogans*; the identification of a determinant for susceptibility for equine arteritis virus; studies on the immunology and efficacy of treatment of *Lawsonia intracellularis* and *Rhodococcus* infections in foals; improved diagnostics and treatment of mares with placentitis; and the epidemiology and disease process by which Nocardioform bacteria causes abortion.

The University of Kentucky Animal Genetic Testing and Research Laboratory (AGTRL), which is in the Gluck Center building, has gone through a couple of years of restructuring and is now operating at a much leaner and efficient level. The laboratory received the highest rating possible on the Horse Comparison Test by the International Society for Animal Genetics in 2010. This rating reflects excellent work of highly motivated and skilled staff. Without their hard work and loyalty to this unique service laboratory, we would not have been able to continue this important service to the horse industry.

Recognizing the emerging problem that is anticipated regarding parasite resistance to current dewormers, we have recently recruited Dr. Martin Nielsen from the University of Copenhagen in Denmark to join our exceptional group of parasitologists at the Gluck Center. Dr. Nielsen will join us later this summer.

Faculty and staff at the Gluck Center share your passion for horses and we are committed to improving the health and well-being of horses around the world. In doing so, we really need your help and support. Any contribution, small or large, during these financially challenging times will make a great difference.

Thank you for your support!

Dr. Mats Troedsson, DVM, PhD, Dipl. ACT
Gluck Equine Research Center Director
and Department of Veterinary Science Chair
M.Troedsson@uky.edu
History

The Maxwell H. Gluck Equine Research Center is the only scientific institute in the United States with nearly all faculty conducting full-time research in equine health and diseases.

Construction began on the 81,000 square foot facility in 1986 and was completed in 1987. The center is named after the late Maxwell H. Gluck, owner of Elmendorf Farm in Lexington. Maxwell Gluck and his wife, Muriel, generously donated $3 million to the University of Kentucky in 1983 for construction of the research facility on the condition the gift be matched by $3 million from the state and $3 million from members of the horse industry.

Research

The mission of the Gluck Center is scientific discovery, education and dissemination of knowledge for the benefit of the health and well-being of horses.

Today, the Gluck Center faculty conduct equine research in six targeted areas: genetics and genomics, infectious diseases and immunology, musculoskeletal science, parasitology, pharmacology/toxicology and reproductive health.

Major research accomplishments of researchers at the Gluck Center have had an international impact on equine research. Some of the major research accomplishments include:

- World Organisation for Animal Health (O.I.E.)-designated world reference laboratory for equine rhinopneumonitis, equine influenza and equine viral arteritis
- Developed six major vaccines to protect against strangles, equine influenza, equine rhinopneumonitis, equine viral arteritis, the shaker foal syndrome (toxoinfectious botulism) and validated field safety and efficacy of equine rotavirus vaccine
- Developed diagnostic serological tests for contagious equine metritis (CEM), Tyzzer’s disease, equine protozoal myeloencephalitis (EPM), equine herpesvirus myeloencephalopathy, strangles and equine viral arteritis
- Developed enzyme-linked immunosorbent assay (ELISA) test for drug detection
- Demonstrated the usefulness of artificial lights and progesterone/estradiol treatments for hastening the onset of the breeding season
- Determined the genetic basis for and developed tests for inheritance of certain color coat traits
- Provided leadership in the sequencing of the complete genome of the horse and structural characterization of horse genes
- Performed the definitive experiments that identified the cause of Mare Reproductive Loss Syndrome
The late Maxwell and Muriel Gluck (top) donated $3 million to the University of Kentucky for construction of the research facility on the condition the gift be matched by the state and members of the horse industry. (Below) James Bassett III, former president of Keeneland, Muriel Gluck and former UK President Otis A. Singletary broke ground for the center in 1985.

Equine Research Hall of Fame

The Equine Research Hall of Fame, established by the University of Kentucky Equine Research Foundation (now the UK Gluck Equine Research Foundation), honors those distinguished researchers who have dedicated their careers to equine science. The Hall of Fame is at the Gluck Center.

On Dec. 1, 1990, 12 scientists became the first inductees into this prestigious hall. Inductees are selected for the honor by an international scientific committee that evaluates the achievements and contributions of eminent researchers who were nominated by their peers and colleagues. The inductees, active, retired or deceased, are individuals from throughout the world who have expanded the body of knowledge of equine science through their contributions to basic or applied research.

The Equine Research Hall of Fame provides a lasting tribute to the most renowned equine researchers in a variety of disciplines and serves as an international forum for honoring outstanding achievements in equine research.

Gluck Equine Research Foundation

The Gluck Equine Research Foundation was formed as a non-profit organization to provide the exchange of information between the Gluck Center and the horse industry and to secure research funds.

Since the Foundation’s inception, it has been highly supportive in raising funds for equine research, endowed faculty positions, and facilities. Funding for graduate student support has allowed Gluck Center faculty to educate the next generation of scientists.

Industry Outreach

Providing research information to the equine community is an important facet of the Gluck Center. Information is shared through the Gluck Center’s website, www.ca.uky.edu/gluck, and three newsletters:

- Bluegrass Equine Digest (monthly)
- Lloyd’s Equine Disease Quarterly
- Research & Service Report (biennially)

Department of Veterinary Science

The Gluck Center is part of the Department of Veterinary Science along with the Animal Genetics Testing and Research Laboratory (AGTRL) and the Veterinary Diagnostic Laboratory (VDL).

The mission of the Department of Veterinary Science is to assure the health and viability of animal agriculture through teaching, discovery, research and service.

Faculty in the Department of Veterinary Science frequently collaborate on research projects with faculty in UK’s College of Agriculture and College of Medicine, with veterinarians in central Kentucky and scientists at other institutions.

The Gluck Center is also part of the UK Equine Initiative, an overarching concept for all equine activities in the College of Agriculture. Created in 2005 as a front door to equine programs at UK, the Equine Initiative’s mission is to discover, share and apply new knowledge that will enhance the health, performance and management of horses commensurate with the signature status of Kentucky’s equine industry.
Twenty-two faculty at the Gluck Equine Research Center are assisted by students, post docs and visiting scientists in conducting research in the areas of:

- Genetics and Genomics
- Infectious Diseases and Immunology
- Musculoskeletal Science
- Parasitology
- Pharmacology/Toxicology
- Reproductive Health

Some of the world’s top scientists are drawn to the Gluck Center to provide solutions to equine health problems. Gluck Center faculty also respond to some of the equine industries toughest problems.
RESEARCH SNAPSHOT...

- Contracted foal syndrome
- Parrot mouth
- Cytogenetics and infertility
- Swayback
- Dwarfism
- Coat color genetics
- Junctional epidermolysis bullosa (JEB)

Faculty, Students & Research Assistants...

Ernie Bailey, Professor
Debbie Cook, PhD Candidate
John Eberth, MS Candidate

Teri Lear, Associate Professor
Rose McGee, MS Candidate
Judy Lundquist, Research Technician

Kathryn Graves, Assistant Professor

James MacLeod, Professor (See page 20)

Education:
PhD – University of California-Davis (Genetics), 1980
MS – University of California-Davis (Comparative Pathology), 1975
BS – University of California-Davis (Genetics), 1973

Interest:
Immunogenetics and genomics—We are interested in the genetic influences on the innate and adaptive immune systems which protect the horse from infectious diseases. Development of the genetic map for horses and investigation of genes involved in the health of the horse such as contracted tendons, extreme lordosis and dwarfism. Color coat variation is also being investigated.

Projects:
- Genomics and gene mapping in horses.
- Investigation of the hereditary aspects of EIPH, swayback, dwarfism, cataracts and equine arteritis virus susceptibility.

Graduate students focus:
Debbie Cook – swayback
John Eberth – dwarfism

A “G gnome” stands in front of Twilight, a Thoroughbred mare at Cornell University, who was the first horse genetically sequenced in 2007. (Photo: Ernie Bailey)

Kathryn Graves, PhD
Assistant Professor
Director, Animal Genetics Testing and Research Laboratory

Education:
PhD – Cornell University, 1985
BS – Cook College, Rutgers University, 1980
Interest:
Overseeing a high quality Animal Genetics Testing and Research Laboratory and providing genotyping services to 50 equine registries. In addition, the lab offers specific tests for color genes and heritable disease mutations.

Projects:
• Develop new DNA-based color tests.
• Candidate gene sequencing to identify causative mutations for heritable diseases.

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Horse metaphase chromosomes (the blue sticks, nuclei are round) from a male horse. Green and red spots are horse genes mapping to the X chromosome. Note: Males have one X and one Y chromosome, thus spots only show up on one X and not two as you would see in females with two X chromosomes.

(Photos: Teri Lear)

Teri Lear, PhD
Associate Professor

Education:
PhD – University of Kentucky (Genetics), 1997
MS – University of Louisville (Cytogenetics/Zoology), 1986
BA – Indiana University Southeast (Zoology/Field Biology), 1975

Interest:
Providing clinical cytogenetics services to the horse industry. Identifying genes causing inherited diseases such as contracted foal syndrome, lordosis in Saddlebreds, dwarfism, parrot mouth, etc. I also provide clinical cytogenetic services to veterinarians in the United States and abroad. This has resulted in the detection of several chromosomal abnormalities.

Clinical Cytogenetics Service: In keeping with the service and outreach mission of the University, my lab offers clinical cytogenetics services to equine veterinarians. Between 1.5% and 3% of the general horse population carries a chromosome abnormality including abnormalities of sex chromosomes, trisomy, and chromosome translocations. Chromosome abnormalities can profoundly affect fertility and survival. Cytogenetic techniques used in my lab can identify chromosome abnormalities causing infertility, ambiguous sex, and congenital abnormalities. We have identified chromosome abnormalities affecting mare fertility, causing severe congenital abnormalities in foals, and causing sexual ambiguity (Lear et al. 1999; Lear and Layton 2002; Lear et al. 2008; Lear and Bailey 2008; Villagomez et al. 2010).

Projects:
• Equine chromosome disorders causing repeated early embryonic loss and congenital abnormalities.
• Identifying the cause of Contracted Foal Syndrome.
• Causes of XY sex-reversal syndrome in horses.
• Behavioral genomics of the White-Throated Sparrow.
• Genomic gains and losses that cause congenital abnormalities in foals.

Graduate student focus:
Rose McGee – Disorders of sexual development in horses
Infectious Diseases and Immunology

RESEARCH SNAPSHOT...

• Equine rhinopneumonitis
• Equine influenza
• Equine viral arteritis
• Equine infectious anemia
• Equine rotaviral enteritis
• Strangles and other equine streptococcal diseases
• Equine leptospirosis
• Equine clostridial enteritis
• Lawsonia intracellularis enteropathy
• Rhodococcal pneumonia
• Diagnostic test development

• Vaccine development
• Disease surveillance and reporting
• Biosecurity/Disaster preparedness
• The development of immunity in the foal
• The immune response in aged horses
• Identification of vaccine-induced protective immune responses
• Characterization of inflammatory responses in the horse
• Cytokine regulation of immunity in the horse

Faculty, Students & Research Assistants...

Sergey Artiushin, Assistant Professor

Udeni Balasuriya, Associate Professor
  Juliana Campos, MS Candidate
  Pamela Henney, Research Specialist
  Yanqiu Li, Postdoctoral Scholar
  Zhengchun Lu, PhD Candidate
  Kristin Pfahl, MS Candidate
  Kathryn Smith, PhD Candidate
  Jianqiang Zhang, Postdoctoral Scholar

Undergraduates:
  Beverly Balasuriya
  Bora Nam
  Gong Seoul
  Jena White

Thomas Chambers, Associate Professor
  Stephanie Reedy, Research Specialist
  Sanjay Sarkar, PhD Candidate
  Ashish Tiwari, PhD Candidate
  Liang Zhang, PhD Candidate

Frank Cook, Assistant Professor
  Debbie Even, PhD Candidate

Roberta Dwyer, Professor

David Horohov, Professor
  Amanda Adams, Postdoctoral Scholar
  Alex Betancourt, Research Technician
  Chong Liu, PhD Candidate
  Allen Page, PhD Candidate
  Lingshuang Sun, PhD Candidate

Undergraduates:
  Daniel Michler

Craig Stewart
  Eric Oberst
  Sean Siaens

Charles Issel, Professor
  Sheila J. Cook, Research Scientist

John Timoney, Professor
  Rafaela De Negri, PhD Candidate
  Michael Fettinger, Research Technician
  Marie-Lucie Styza, Exchange Scholar from France
  Sridhar Velineni, Postdoctoral Scholar

Peter Timoney, Professor
  Yun Young Go, PhD Candidate
  Jessica Hennig, MS Candidate
  Barry Meade, PhD Candidate
  Kathleen Shuck, Research Analyst Principal

Visiting scientists in 2010:
  Juliana Fulgencio, Visiting Scholar (Brazil)
  Katherine Hughes, DVM student (USA)
  Muhammad Ijaz, DVM, M.Phil, PhD (Pakistan)
  Julia Krause, PhD student (USA)
  Soo-Jeong Kye, DVM, MVSc (Korea)
  Nettie Lamprecht, PhD student (USA)
  Melanie Lean, MS student (United Kingdom)
  Fabien Miszczak, PhD student (France)
  Kalimuthusamy Natarajaseenivasan, PhD, BSc, MSc (India)
  Dan Shen, veterinarian, (China)
  Lisa Tadros, PhD student (USA)
  Ivan Francisco Vazquez, MS student (Spain)
Sergey Artiushin, PhD  
Assistant Professor

Education:
PhD – Moscow State University (Microbiology), 1981  
MS – Moscow Veterinary Academy (Biophysics), 1973  

Interest:
Research interests are focused on molecular studies of *Streptococcus equi*,  
*Streptococcus zooepidemicus*, and *Leptospira interrogans*. *S. equi* causes strangles and *S. zooepidemicus* is responsible for endometritis in mares. Leptospirosis can cause abortion and stillbirth as well as recurrent uveitis (a major cause of equine blindness).

Projects:
• Development of rapid diagnostic assays for identification of bacterial pathogens.  
• Study of surface and secreted proteins of *Streptococcus* as virulence factors and potential protective antigens.  
• Analysis of genetic variations in *Streptococcus*.  
• Identification of virulence factors of *S. zooepidemicus* responsible for developing acute infection in dogs and horses.

Udeni Balasuriya, PhD, MS, BVSc  
Associate Professor

Education:
PhD – University of California-Davis (Comparative Pathology with special emphasis in molecular virology), 1996  
MS – University of California-Davis (Comparative Pathology with special emphasis in diagnostic pathology), 1991  
BVSc – Faculty of Veterinary Medicine and Animal Science, University of Peradeniya, Peradeniya, Sri Lanka, 1985  

Interest:
The major research focus of my laboratory is to characterize the molecular epidemiology and pathogenesis of equine arteritis virus (EAV) and equine herpesvirus-1 (EHV-1) infections of horses and develop improved recombinant vaccines to prevent infection of horses with these viruses, as well as to develop improved tests to diagnose the infection. In addition, I have established national and international collaborations to facilitate exchange of scientists, reagents and information focused on EAV, EHV-1 and other equine viral diseases. My laboratory also provides a dynamic, first-rate research training environment to develop the next generation of research scientists.

Projects:
• Molecular characterization of equine arteritis virus (EAV) and equine herpesvirus-1 (EHV-1).  
• Definitively characterize the molecular epidemiology and pathogenesis of EAV and EHV-1 infections of horses and develop improved recombinant vaccines to prevent infection of horses with these viruses as well as improved tests to diagnose the infection.  
• Molecular mechanisms of viral pathogenesis and characterization of host immune response to EAV infection.  
• Host-virus interactions (e.g. analysis of individual viral genes/gene products and their interaction with host).  
• Development of new diagnostic and vaccine technologies, define the epidemiology and pathogenesis of other important viral diseases of the horse, and the recognition of novel and emerging viral diseases of the horse.  
• Establish national and international collaborations to facilitate exchange of scientists, students, reagents and
information, all focused on EAV, EHV-1 and other important viral diseases of the horse.

Services:
• Provide assistance with molecular diagnostics (RT-PCR and real-time RT-PCR).
• Testing of clinical specimens submitted to the OIE designated reference laboratory for equine viral arteritis (EVA) at the Gluck Equine Research Center.
• Testing of clinical specimens submitted to the OIE designated reference laboratory for equine influenza at the Gluck Equine Research Center.
• Provide molecular diagnostic reagents to diagnostic laboratories.
• Provide advice on equine viral arteritis to veterinarians and equine industry associates over the phone.

Postdoctoral/Graduate students focus:
Juliana Campos – Genetic susceptibility of stallions to EAV
Yanqiu Li – Molecular characterization of neurovirulent EHV-1
Zhengchun Lu – EAV attachment and entry and molecular diagnostics
Kristin Pfahl – Development and validation of improved serological assays for EVA
Kathryn Smith – Virulence determinants of EHV-1
Jianqiang Zhang – Molecular characterization of EAV

Thomas Chambers, PhD
Associate Professor

Education:
PhD – University of Notre Dame (Microbiology), 1982
BS – University of Notre Dame (Pre-Professional Studies), 1975

Interest:
Equine influenza is the leading cause of respiratory disease in Kentucky and the world. My major interest is to study the innate immune responses to the influenza virus and herpes virus. I am also interested in the development of vaccines for influenza and herpes virus. I am involved in infectious disease control and surveillance both nationally and internationally.

Projects:
• Infectious diseases and immunology.
• Testing in equines of a second-generation modified-live virus equine influenza vaccine.
• Testing/validation of second-generation rapid diagnostic tests for equine influenza.
• Testing in equines of novel DNA-based vaccines for equine influenza.
• Testing in equines of new vaccination protocols for equine influenza using an existing commercial vaccine.
• Collaborator on development of the most up-to-date phylogenetic description of the strains of equine influenza virus in circulation since 1990.
• Collaborator on development of a new real-time RT-PCR assay for equine influenza.
• OIE International Reference Laboratory for equine influenza.

Graduate students focus:
Sanjay Sarkar – innate immunity to equine viral respiratory diseases
Ashish Tiwari – innate immunity to equine viral respiratory diseases
Liang Zhang – comparative pathogenesis of equine- and equine-2 influenza viruses
R. Frank Cook, PhD
Assistant Professor

Education:
PhD – University of Warwick (Virology), 1980
BSc – University of Sussex (Biochemistry), 1976

Interest:
My research focuses on Equine Infectious Anemia Virus (EIAV), a virus closely related to HIV in humans. My most recent interests are in the field of vaccine design.

Projects:
• Design of vaccines against all lentiviruses including HIV-1.
• Provide purified antigens for inclusion in commercial USDA-approved test kits.
• Strategies to enhance efficacy of DNA vaccination in the horse (i.e., the use of cytokines to enhance the efficacy of vaccines).
• Molecular epidemiology of equine herpesviruses.
• Genetic basis of differing susceptibility to disease and immune responses to vaccinations.

Graduate student focus:
Debbie Even – Manipulating immune responses to DNA vaccines in the horse

Robert Dwyer, DVM, MS, DACVPM
Professor

Education:
DVM – Iowa State University, 1985
MS – University of Kentucky, 1990
Diplomate, American College of Veterinary Preventive Medicine, 1993
Board Certified in Epidemiology, ACVPM, 2003

Interests:
Equine preventive medicine and infectious diseases, disease outbreak investigation and epidemiology, biosecurity, disaster preparedness and response, risk reduction to agroterrorism and pre-veterinary advising and undergraduate teaching.

Projects:
• Consultations for veterinarians, farm managers and horse owners.
• Biosecurity plan development for veterinary and farm facilities.
• AAEP on-call media veterinarian for infectious disease issues.
• Instructor for a national extension program, “Strengthening Community Agrosecurity Plans.”
• Co-editor of Lloyd’s Equine Disease Quarterly.
• Planning section chief for a national Incident Management Type II team (disaster response team).
Education:
Professor of Veterinary Immunology, Louisiana State University, 1988-2003
Fellowship – FDA, Bethesda, MD, 1986-1988
PhD – University of Tennessee, 1985
MS – Purdue University, 1981
BS – Pennsylvania State University, 1978

Interest: My group continues to investigate the immune responses of horses to various infectious diseases. We are also interested in infections that occur later in the life of the foal, such as *Lawsonia intracellularis*, and age-related changes in the immune function in older horses. We also collaborate with other groups to study the characterization of cell-mediated immune responses in EIA-infected and vaccinated horses, vaccination of foals against equine influenza virus, further investigations into parasite immunology and the characterization of inflammatory responses to exercise.

Projects:
• Underlying immunological basis for the susceptibility of foals to infection with *Rhodococcus equi*, a cause of pneumonia in foals less than 3 months old.
• Investigating the underlying molecular mechanism for low levels of interferon-gamma, a cytokine that plays a central role in resistance to *R. equi* and other pathogenic organisms. (Linshuang Sun)
• Infections that occur later in the life of the foal, such as *Lawsonia intracellularis*, the causative agent for equine proliferative enteropathy (EPE). (Allen Page and Amanda Adams)
• Role of nutritional supplements in restoring immune function in aged horses. (Amanda Adams)
• Older horse immune function. Collaborating with Kristine Urshel, UK Department of Animal Science, who is interested in the effect of aging on protein metabolism in horses, and Nicholas Frank, University of Tennessee, who is interested in metabolic syndrome in horses. Frank’s group is also interested in obesity-related inflammatory changes and their role in the induction of metabolic disease in the horse.
• Interactions between adipocytes and the immune system. (Amanda Adams)
• Cell-mediated immune responses in EIA-infected and vaccinated horses. The goal will be to identify immunological responses that may be important in controlling viral replication and disease. (Chong Liu, in collaboration with Charles Issel at the Gluck Center and Ron Montelaro at Pittsburgh)
• Other collaboration projects include: vaccination of foals against equine influenza virus with Thomas Chambers at the Gluck Center; parasite immunology with Gene Lyons at the Gluck Center; and characterization of inflammatory responses to exercise with Ken McKeever, at Rutgers University. Our goal is to identify immunological markers for exercise-induced inflammation in the horse and to determine if these correlate with the risk of injury in the performance horse.

Postdoctoral/Graduate students focus:
Amanda Adams – Aged horses and obesity
Chong Liu – Cell-mediated immunity to EIAV
Allen Page – *Lawsonia intracellularis* infection and immunity
Lingshuang Sun – Regulation of interferon in foals
Charles Issel, DVM, PhD
Wright-Markey Chair in Equine Infectious Diseases & Professor

Education:
Diplomate – American College of Veterinary Microbiologists, 1976
PhD – University of Wisconsin (Veterinary Science), 1973
MS – University of Wisconsin (Veterinary Science), 1971
DVM – University of California–Davis, 1969
AB – University of California–Berkeley (Zoology), 1965

Interest:
Our research, continuous since 1974, involves equine infectious anemia from A to Z. We are working with the national and international veterinary community to develop and implement sensitive, specific and practical diagnostic tests for EIA to complement the “Coggins” test in effective control programs. Our work indicates that we should adopt a three-tiered testing approach which would more accurately detect positive horses with difficult to read AGID test reactions (see center photo below with three such positive samples).

At the same time we are studying the intricacies of the EIA virus (EIAV), a lentivirus, in an attempt to define the genetic and antigenic variations in this highly mutable agent and how it impacts protective immunity, i.e., vaccine design and efficacy. This work is valuable in its own right as well as being of comparative value as a model for AIDS.


Projects:
• Improve diagnosis and control of EIA.
• Develop effective vaccines against EIA.
• Provide high quality reagents for use in testing for diseases.
• For more information on EIA please see our website at: http://dept.ca.uky.edu/eia/.

Horseflies are vectors of EIA
(Photo by Alex Wild)

Coggins test plate

Humans are still major vectors of EIA

The Major Threat of EIA
Education:
PhD – National University of Ireland, 1969
MS – University of Wisconsin, 1967
MVB, MRCVS – University College, Dublin, 1965
BSc – University College, Dublin (Biology), 1961

Interest:
Focus is on equine infectious disease caused by streptococci, leptospira, salmonella and clostridia. Ultimate goals include development of improved vaccines, diagnostics and design of strategies effective in management of outbreaks and detection of infected horses.

Projects:
- Use of the binding sites of Toxins A and B of *Clostridium difficile* as immunogens to generate toxin neutralizing antibody in pregnant mares.
- Identification and regulation of virulence factors of *Streptococcus zooepidemicus* from acute equine and canine pneumonias.
- Wildlife source(s) of the specific genotype of *Leptospira interrogans* serovar Pomona responsible for equine abortions in Kentucky.
- Development of novel modalities for intranasal vaccination of horses against strangles.
- Rapid diagnostic assays for *Streptococcus equi* and *Leptospira interrogans* in equine clinical specimens.
- Development of protocols for prepartum immunization of mares for prevention of neonatal enterocolitis caused by clostridia and salmonella.
- Role of bacteriophage in virulence and evolution of *Streptococcus equi*.
- Identification of proteins of *Leptospira interrogans* induced following ocular and placental infection of the horse.
- Interaction of *Streptococcus equi* with the equine tonsillar complex.

Postdoctoral/Graduate students focus:
Rafaela De Negri – Streptokinases of *Streptococcus equi* and *zooepidemicus*
Marie-Lucie Styza – Detection of serum antibodies specific for *Clostridium difficile*
Sridhar Velineni – Regulation of virulence in *Streptococcus zooepidemicus*

A scanning electron micrograph (left) shows adherence of *Streptococcus equi*, the cause of equine strangles, to stratified squamous epithelium of the equine lingual tonsil. The photo (right) shows *S equi* within the epithelium of the nasopharyngeal tonsil of a horse three hours after infection. (Photos: John Timoney)
Education:
FRCVS – Royal College of Veterinary Surgeons, 1978
PhD – University of Dublin, 1974
MS – University of Illinois, 1966
MVB (Hons) – National University of Ireland, 1964

Interests:
Among the diseases of major interest are equine viral arteritis (EVA), contagious equine metritis (CEM) and equine rhinopneumonitis. Also, development of strategies for reducing the risk of global spread of infectious diseases through international trade.

Projects:
• Studies on the mechanism of establishment and persistence of equine arteritis virus in the reproductive tract of the stallion.
• Characterizing the site(s) of localization of equine arteritis virus in the carrier stallion.
• Investigating the variation in virulence among naturally occurring strains of equine arteritis virus.
• Developing a less costly, more rapid diagnostic test for EVA.
• Developing a second generation marker vaccine for EVA/equine arteritis virus infection.
• Developing a more rapid and reliable diagnostic test for detection of Taylorella equigenitalis.
• Improving control and prevention strategies for contagious equine metritis (CEM).
• Study of the epidemiology of Taylorella asiigenitalis in horses and non-horse equids.

Services:
• Responsible for operation of the OIE Reference laboratory for equine viral arteritis at the Gluck Equine Research Center.
• Provision of EVA diagnostic reagents to diagnostic laboratories, nationally and internationally.
• Provide consultation for veterinarians and members of the horse industry on various equine infectious diseases, including EVA, equine rhinopneumonitis, contagious equine metritis and equine piroplasmosis.
• Co-editor of the Lloyd’s Equine Disease Quarterly.
• Provide quarterly reports to the International Collating Centre, Animal Health Trust, Newmarket, UK, on equine infectious disease occurrences in the United States.

Graduate students focus:
Yun Young Go – Molecular characterization of EAV humoral antibody response of horse to non-structural virus proteins and host virus interactions
Jessica Hennig – To Be Determined
Barry Meade – Comparisons of the transmission dynamics of disease outbreaks attributable to neuropathogenic and non-neuropathogenic strains of EHV-1 in closed populations
RESEARCH SNAPSHOT...

- Osteoarthritis
- Articular cartilage maturation and repair
- Wobbler Syndrome
- Tendons and ligaments

Faculty, Students & Research Assistants...

James MacLeod, Professor
Stephen Coleman, PhD Candidate
Rebekah Cosden, PhD Candidate
Lauren Detlefsen, MS (graduated, 2010)

Jennifer Janes, PhD Candidate
Kadie Vanderman, MS (graduated, 2010)
Wenying Zhu, PhD Candidate

James MacLeod, VMD, PhD
Professor

Education:
Fellowship – University of Pennsylvania (Endocrinology & Genetics), 1992
PhD – University of Pennsylvania, 1990
VMD – University of Pennsylvania, 1984
BS – University of Delaware, 1980

Interest:
The laboratory studies biological and biomedical aspects of the musculoskeletal system, with an emphasis on the growth and maturation of articular cartilage, the development of osteoarthritis, repair of articular lesions and the effects of anti-inflammatory medications. Experiments are conducted primarily on a cellular and molecular level. In addition to articular cartilage, recent projects have been initiated on tendons, cervical stenotic myelopathy (Wobbler Syndrome), and broad analyses of the equine transcriptome.

Projects:
- Articular cartilage maturation.
- Articular cartilage repair.
- Intra-articular glucocorticoid therapy.
- Tendon maturation.
- Wobbler syndrome (cervical stenotic myelopathy).
- Horse genomics: gene expression.

Graduate students focus:
Stephen Coleman – equine transcriptome
Rebekah Cosden – articular cartilage maturation and repair
Jennifer Janes – pathogenesis of cervical vertebral stenotic myelopathy
Wenying Zhu – osteoarthritis and intra-articular glucocorticoid therapy

Graduate degrees complete:
Lauren Detlefsen (MS) – tendon maturation and response to biomechanical stress
Kadie Vanderman (MS) – chondrocyte cell biology
RESEARCH SNAPSHOT...

• Helminths, including life cycles, prevalence and control
• Equine protozoal myeloencephalitis
• Parasite resistance

Faculty, Students & Research Assistants...

Daniel Howe, Associate Professor
Sriveny Dangoudoubiyam, Postdoctoral Scholar
Breanna Gaubatz, MS student
Ablesh Gautam, PhD Candidate
Michelle Yeargan, Research Specialist

Sandra Collins, Senior Laboratory Technician
Sharon Tolliver, Research Specialist

Visiting Scientists:
Ulla Andersen, DVM (Denmark)
Tetiana Kuzmina, PhD (Ukraine)
Ivan Francisco Vazquez, BVM (Spain)
Maria Sol Arias Vázquez, PhD (Spain)

Eugene Lyons, Professor

Daniel Howe, PhD
Associate Professor

Education:
PhD – Purdue University (Molecular Parasitology), 1992
MS – Western Illinois University (Biology/Parasitology), 1990
BS – Western Illinois University (Biology), 1988

Interest:
Molecular studies of protozoan parasites – The primary research goal is to obtain a better understanding of the parasite Sarcocystis neurona, the primary cause of equine protozoal myeloencephalitis (EPM). Studies are ongoing to determine the genome sequence for S. neurona. Other interests include the development of improved serum assays for EPM diagnosis. Additionally, we are investigating approaches to develop an effective vaccine against EPM.

Projects:
• Characterization of novel genes and antigens from the parasite Sarcocystis neurona.
• Development of a serologic assay for diagnosis of EPM and to develop a vaccine for EPM.
• Sequencing and annotation of the S. neurona genome.

Graduate students focus:
Breanna Gaubatz – Genetic analysis of EPM horses
Ablesh Gautam – Characterization of the SnSAG family of surface antigens in Sarcocystis neurona

Eugene Lyons, PhD
Professor

Education:
PhD – Colorado State University (Parasitology), 1963
MS – Kansas State University (Parasitology), 1958
BS – South Dakota State University (Wildlife), 1956

Interest:
Parasitology: Control and transmission of internal parasites of horses. Nearly all dewormers currently on the market were tested for efficacy on internal...
parasites here in the Department of Veterinary Science. Studies are ongoing on resistance of small strongyles and ascarids to commercial dewormers. Other research is concentrated on profiling the passage of small strongyle eggs in feces (EPGs) of older horses. This is to try and determine which animals are low egg shedders, and thus don’t need deworming, and which ones are “high” egg shedders, which are needing antiparasitic treatment. Other research is on internal parasites of wildlife, especially hookworms in pinnipeds.

Projects:
• Control, transmission and prevalence of natural infections of internal parasites of horses.
• Drug resistant nematodes in field and critical/controlled tests.
• Seasonal and yearly transmission.
• Molecular identification of parasite species and basis of drug resistance.

Fluorescently-labeled *Sarcocystis neurona* parasites (green) adjacent to the infected cell’s nucleus (blue). *(Photo: Dan Howe)*

Bot (Gasterophilis intestinalis) insect larvae of horses. First, second and third instars found in the mouth and/or stomach (on left) and first instar in an egg attached to a horse hair (on right). *(Photos: Gene Lyons)*
RESEARCH SNAPSHOT...

- Therapeutic medication regulation
- Establishing world wide reference standards for therapeutic medications, dietary and environmental substances.
- Developing novel ELISA-based forensic tests
- Development of specific and sensitive tests to detect ergot alkaloids (associated with fescue toxicity and other diseases)
- Development of novel therapies for infectious and other diseases

Faculty, Students & Research Assistants...

Thomas Tobin, Professor
Charlie Hughes, Research Associate
Julio Gutierrez, Postdoctoral Fellow

Gabrielle Herrensmith, Student assistant
Emily Schwartz, Student assistant

Thomas Tobin, MVB, MSc, PhD, MRCVS, DABT
Professor of Veterinary Science and the Graduate Center for Toxicology

Education:
DABT – Diplomate, American Board of Toxicology, 1980
PhD – University of Toronto (Pharmacology), 1970
MSc – University of Guelph (Pharmacology), 1966
MVB – University College, Dublin, 1964

Contributions:
1983: Regulatory threshold for furosemide.
1985-Present: About 100 ELISA tests for equine medications, licensed to Neogen Corp.
2003: US Copyright on unique biological mechanism of MRLS.

Projects:
- Ongoing research on certified reference standards and internal standards licensed to Neogen Corp.
- Creation of ELISA tests for drug detection and certified reference standards for therapeutic medication regulation.
- Developing animal models of ocular, fetal and central nervous system parasitic disease and demonstrating the therapeutic efficacy of specific chemotherapeutics.
- Developing improved assays for ergot alkaloid analysis, the group of toxins involved in fescue toxicosis.

Postdoctoral/Graduate students focus:
- Relationships between medication or medication residue concentrations and pharmacological effects in the contexts of resulting therapeutic responses and/or the regulatory significance of medication residues with respect to competitive events.

Rompun®, the widely used short acting equine tranquilizer is detected in equine urine as 4-hydroxyxylazine, a Rompun® metabolite fragment. We have synthesized 4-hydroxyxylazine (above) for use as a regulatory standard. This X-ray crystallograph definitively establishes the identity and structure of our reference standard. (Photo: Thomas Tobin)
RESEARCH SNAPSHOT...
• Causes, diagnosis and treatment of embryonic and fetal loss in mares
• Early embryonic development
• Uterine infection
• Nutritional affects on reproduction
• Stallion behavior
• Diagnosis and treatment of fertility problems in stallions
• Fescue toxicosis

Faculty, Students & Research Assistants...

Barry Ball, Professor
Lauren Keith, MS Candidate

Karen McDowell, Associate Professor
Drew Hestad, MS Candidate

Ed Squires, Professor
Katheryn Cerny, MS Candidate
Sydney Hughes, MS Candidate

Tom Swerczek, Professor

Mats Troedsson, Professor
Kirsten Scoggin, PhD, Senior Scientist
Claudia Klein, PhD (graduated, 2010)
Lynda Miller, PhD (graduated, 2010)
Ana Gabriella Toro Mayorga, MS Candidate
Elizabeth Woodward, PhD Candidate

Visiting Scientists:
Mohammed Ababneh, DVM, PhD (Jordan)
Mette Christoffersen, DVM (Denmark)
Morten Møller Petersen, DVM, PhD, Dipl. ACT (Denmark)
Jasmine Walters, DVM (Germany)

Barry Ball, DVM, PhD, Dipl. ACT
Professor

Education:
Dipl. ACT – 1987
PhD – Cornell University, 1987
DVM – University of Georgia, 1981

Projects:
• Studies on anti-Müllerian hormone in the mare and stallion.
• Down regulation of oxytocin receptors and luteal maintenance in mares.
• Bioactivity of 5 α-dihydroprogesterone in mares.
• Diagnostic methods related to placentitis and late abortion in mares.
• Nonsurgical control of reproductive behavior in the stallion.

Graduate students focus:
Lauren Keith – Suppression of estrous in race mares
Juliana Almeida (PhD, UC Davis) – Anti-Mullerian hormone in the horse
Liz Scholtz (PhD, UC Davis) – Role of 5-alpha reduced progestins in equine pregnancy
Karen McDowell, PhD, EMB
Associate Professor

Education:
EMB – Certified Embryologist, American College of Embryology, 2010
NIH Postdoctoral Fellow – Colorado State University (Physiology), 1987
PhD – University of Florida (Animal Science), 1986
MS – University of Tennessee (Animal Science), 1980
BS – University of Tennessee (Animal Science), 1976

Interest:
Determining causes of reproductive losses in mares, including maternal-embryo or maternal-fetal interactions, mare reproductive loss syndrome, and most currently, effects of endophyte-infected fescue on pregnant mares. Overall goal is to reduce pregnancy losses and enhance pregnancy maintenance in mares.

Projects:
• Vascular changes associated with consumption of endophyte-infected fescue.
• In vitro assessment of ergot alkaloids, receptor agonists and receptor antagonists on equine peripheral and central arteries.

Graduate students focus:
Drew Hestad – Equine fescue toxicosis

Edward Squires, PhD, Dipl. ACT (hon.)
Professor, Executive Director of the Gluck Equine Research Foundation and Director of Advancement and Industry Relations

Education:
Dipl. ACT (hon.) – 2003
PhD – University of Wisconsin, 1974
MS – West Virginia University, 1971
BS – West Virginia University, 1969

Interest:
Improving the reproductive efficiency of both mares and stallions, hormonal control of the cycle and development of reproductive techniques. Sydney Hughes (MS student) is conducting two projects: 1) investigating the viability, economic value and performance of offspring from mares that were treated for placentitis during late gestation; and 2) the effect of age, season and status of the mare (barren, maiden, foaling) on dystocia (difficult births). Katheryn Cerny is studying the transmission of bacteria from stallions to mares.

Projects:
• Examination of farm records: performance of surviving foals out of mares treated for placentitis and incidence and outcomes of dystocia (Hughes)
• Potential transfer of bacteria from infected stallions to mares – does this occur and then affect pregnancy rates? (Cerny)
Graduate students focus:
Katheryn Cerny – Transmission of bacteria from the stallion to the mare and its effect on pregnancy rate and embryonic losses
Sydney Hughes – Reproductive problems in late pregnancy mares

Projects:
• Density gradient centrifugation of frozen semen (Hughes and Cerny)
• Induce twin pregnancy to double eCG levels (Hughes)
• Uterine rupture in mares (Toro Mayorga)
• Establishment of sustained EAV infection (Campos)

Tom Swerczek, DVM, PhD
Professor

Education:
PhD – University of Connecticut (Comparative Pathology), 1969
MS – University of Connecticut (Nutritional Pathology), 1966
DVM – Kansas State University, 1964
BS – Kansas State University, 1962

Interest: Nutritional Pathology. Factors that cause abortion in mares, including climatic and environmental changes that induce stress to pasture forages. Drought, excessive rainfall, frosts and freezes can induce nutrient imbalances.

Projects:
• Evaluation of bacterial endophytes of grass-and-legume forages as emerging causes of reproductive loss in horses.
• Develop diagnostic tests for tissues and blood to aid in diagnosis of fetal loss.
Mats Troedsson, DVM, PhD, Dipl. ACT, Dipl. ECAR
Professor, Director of the Gluck Equine Research Center, and
Chair of the Department of Veterinary Science

Education:
Dipl. ECAR – 2002
Dipl. ACT – 1993
PhD – University of California – Davis, 1991
DVM – Royal Veterinary College (Stockholm, Sweden), 1975

Interest:
Equine reproductive health and biology. 1) The interaction between spermatoza and the uterine immune system with a particular note on its role in breeding-induced endometritis. 2) The role of seminal proteins in fertility. 3) Claudia Klein, PhD, is using a genomic approach to study the interaction between the mares’ uterus and the early conceptus during the critical time of pregnancy recognition. 4) Diagnostics and treatment of high-risk pregnancies.

Projects:
• Interaction between semen and the uterus in horses.
• Identification of seminal plasma proteins that affect fertility.
• Sperm surface proteins.
• Early pregnancy recognition and losses.
• Inflammation of the uterus – role of nitric oxide and inflammatory cytokines.
• Causes, diagnostics and control of high-risk pregnancies.

Graduate students focus:
Ana Gabriella Toro Mayorga – uterine pathology/biopsies
Elizabeth Woodward – endometritis

PhD Dissertations:
Claudia Klein. 2010. Early pregnancy recognition/genomics
Lynda Miller. 2010. Sperm surface proteins
Gluck Equine Research Center

Competitive Grant Funding

Non-Competitive Grant Funding

Awards

The mission of the Gluck Center is scientific discovery, education and dissemination of knowledge for the benefit of the health and well-being of horses.
Funding is important to equine research. The faculty at the Gluck Equine Research Center were successful in obtaining several competitive and non-competitive grants, some of which were multi-year grants.

**Competitive Grant Funding**


Howe, D. 2009-2012. USDA/CSREES. Genome Sequence for the apicomplexan *Sarcocystis neurona*. $500,000.


Competitive Grant Funding


**Squires, E.L.** 2010. Bioniche Animal Health. Use of eFSH to increase eCG production in mares. (Co-PI: Troedsson, M.H.T.) $8,000.


Non-Competitive Grant Funding


**Balasuriya, U.B.R.** 2010. Gluck Equine Research Center Intramural Grant Support. Cloning of the full-length neuropathogenic equine herpesvirus-1 Findlay strain (T953) genome as an infectious bacterial artificial chromosome (BAC) in E.coli. PI. $6,000.

**Balasuriya, U.B.R.** 2010. Gluck Equine Research Center Intramural Grant Support. Discovery of equine genes associated with the susceptibility to equine arteritis virus (EAV) infection of equine CD3+ T lymphocytes and identification of possible genetic marker(s) for the prediction of the establishment of EAV persistent infection in stallions. Co-PI. $7,000.

**Balasuriya, U.B.R.** 2010. Research Activity Award, College of Agriculture, University of Kentucky. Establishment of the importance of the role of heparin/heparan sulfate as an attachment factor for infection of equine endothelial cells (EECs) with equine arteritis
Awards

Scientific Publications

Books/Chapters in Books

Refereed Journal Articles

Non-Refereed Articles

Presentations/Meetings Attended
Research results conducted by the faculty at the Gluck Center was published in various forms throughout 2010, including books or chapters in books, refereed journal articles and non-refereed articles.

Books/Chapters in Books


Refereed Journal Articles


Ijaz, M., S. Velineni, and J.F. Timoney. 2010. Selective pressure for allelic diversity in SeM of Streptococcus equi does not affect immunoreactive proteins SzPSe or Se18.9. Infection, Genetics and Evolution.


Klein, C., K. Scoggin, and M.H.T. Troedsson. 2010. The expression of Interferon stimulated gene 15 in equine endome-
Refereed Journal Articles


Refereed Journal Articles


Gutierrez, J., R. Eisenberg, G. Herrensmith, T. Tobin, T. Li and S. Long. 2010. Conformational Polymorphism in 2-[(4-hydroxy-2,6-dimethylphenyl) amino]-5,6-dihydro-4H-1,3-thiazin-3-i um Chloride, C66, p 593-595, Acta Crystallographica Section C: Crystal Structure Communications. Ky Ag Expt Station Number 10-14-123 UK #392.


Faculty at the Gluck Equine Research Center are frequent travelers. They are guest speakers at veterinary conferences and meetings locally, nationally and internationally in their respected fields throughout the year.

**INTERNATIONAL**

<table>
<thead>
<tr>
<th>Name</th>
<th>Presentation/Meeting</th>
<th>Location and Dates</th>
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<tbody>
<tr>
<td>Ernie Bailey</td>
<td>Chair Equine Genetics Section, World Congress on Genetics Applied to Livestock Production. Leipzig, Germany, Aug. 1-6</td>
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<tr>
<td>Barry Ball</td>
<td>Anti-Mullerian Hormone: A new endocrine marker for the mare. Tokyo University of Agriculture and Technology, Japan.</td>
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<tr>
<td>Barry Ball</td>
<td>“Ultrasonographic and endoscopic examinations of stallions’ reproductive organs,” “Endocrinological evaluation of prospective and active breeding stallions,” “Diseases of the scrotum and testis,” “Testicular biopsy in the stallion,” “Sperm transit and storage in the mare reproductive tract,” “Oxidative stress in normal and abnormal function of equine spermatozoa,” “Sperm motility, morphology and viability: research with aims to improve.” Rossdales Stallion Subfertility Course, Newmarket, UK.</td>
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<tr>
<td>Charles Issel</td>
<td>“Equine infectious anemia and equine infectious diseases.” Presented to the faculty and students at the University of Agronomic Sciences and Veterinary Medicine, Faculty of Veterinary Medicine, Bucharest, Romania, Dec. 14</td>
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<tr>
<td>Charles Issel</td>
<td>“Equine infectious anemia: the challenges remaining.” Presented to the faculty and students at the University of Agricultural Sciences and Veterinary Medicine, Faculty of Veterinary Medicine, Cluj-Napoca, Romania, Dec. 15</td>
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<tr>
<td>Charles Issel</td>
<td>“Equine infectious anemia: control or eradication?” Presented to the Romanian Veterinary Association Meeting, Cluj-Napoca, Romania, Dec. 17</td>
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<tr>
<td>John Timoney</td>
<td>“Getting to Grips with Strangles.” Invited speaker and chair of workshop on Strangles Vaccine Development. The two-day conference and workshop was organized by the Animal Health Trust. Stockholm, Sweden, May 27-28</td>
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<tr>
<td>Peter Timoney</td>
<td>Participated in Second International Meeting of PrEquID, Prevention of Equine Infectious Diseases Group, Marrakech, Morocco. March 23-27</td>
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<tr>
<td>Peter Timoney</td>
<td>Invited visitor to meet with members of the National Animal Health Authority (SENASA), equine practitioners, horse owners and breeders, laboratory workers and to give presentations and discuss how best to control the outbreak of equine viral arteritis that had occurred, Buenos Aires, Argentina, May 25-28</td>
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<tr>
<td>Peter Timoney</td>
<td>Special Meeting on Equine Viral Arteritis, SENASA, Buenos Aires.</td>
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<tr>
<td>Peter Timoney</td>
<td>Meeting on Current Equine Viral Situation in Argentina, Board of the Argentinean Equine Research Report 2010 • Page 41</td>
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</tbody>
</table>


Peter Timoney. Annual Meeting of Societa Italiana Veterinari per Equini, Milan, Italy.

Peter Timoney. Guandong Entry and Exit Inspection and Quarantine Bureau, Guangzhou, Guandong, PR China.


Ernie Bailey. Poster presentation and participate in horse technical committee and executive committee meetings of NRSP8. Plant & Animal Genome XVIII Conference, San Diego, January


Ernie Bailey. External Review Committee, National Science Foundation Peromyscus Stock Center. Columbia, SC. Nov. 12

Udeni Balasuriya. “Rapid Detection of Foreign, Emerging and Zoonotic Pathogens of Equines.” Center of Excellence for Emerging and Zoonotic Animal Diseases (CEEZAD), Kansas State University, Manhattan, KS. July 28-29

Udeni Balasuriya. “Equine Viral Arteritis: A disease of evolving significance in an area of expanding trade in horses and semen.” Department of Veterinary Science, South Dakota State University, Brookings, SD. Oct. 8

Barry Ball. Society for Theriogenology. Seattle, WA. Aug. 31- Sept. 5

Thomas Chambers. Research Advisory Committee, Grayson Jockey Club Research Foundation, Fort Worth, TX. Jan. 8-10

Roberta Dwyer. “Strengthening Agrosecurity Planning for Communities.” Co-presenter and one of the lead trainers at the two-day workshop in Honolulu and Hilo, HI February


David Horohov. “Parasite Immunology,” “Foal immune response to FluAvert” and “Adverse reactions to vaccines,” Intevet/Schering Plough Equine Meeting, Kansas City, MO. June 28


Howe, D. K., C. L. Schardl, and J. C. Kissinger. “A genome sequence for the apicomplexan Sarcocystis neurona.” Microbial Genome Sequencing and Microbial Observatories Programs Workshop, Plant and Animal Genomes Conference, San Diego, CA, January


James N. MacLeod. Equine articular cartilage maturation and repair: new technologies and models to address longstanding research questions. University of Minnesota. St. Paul, MN.

Karen McDowell. “Of Caterpillars and Horses: What Happened in Mare Reproductive Loss Syndrome and What We Learned.” Invited speaker at the 2nd Annual Woods Lane Farm Equine Reproduction Management Short Course, Mt. Airy, MD, Sept. 16


Edward Squires. Presentation at the Preservation of Equine Genetics Program, Colorado State University, Ft. Collins, CO. Feb. 18

Edward Squires. Stud book and registration committee, American Quarter Horse Convention, Orlando, FL, March 5-8


Edward Squires. World Federation of Sport Horses. Devon, PA. Sept. 29-30

Edward Squires. New Hampshire Veterinary Association. Manchester, NH. Nov. 3

Edward Squires. Bioniche Business Meeting. Baltimore, MD. Dec 4

Edward Squires. “Table Topics on Frozen Semen.” AAEP. Baltimore, MD. Dec 4-8

Peter Timoney. Invited presentation on contagious equine metritis, College of Veterinary Medicine, Oklahoma State University, Stillwater, OK. March 11-12

Peter Timoney. Attended the board of directors meeting of the National Institute for Animal Agriculture and gave a presentation at the equine committee meeting, Kansas City, MO. March 15-17


Peter Timoney. 114th Annual Meeting of the United States Animal Health Association. Minneapolis, MN.

Peter Timoney. 53rd Annual Conference of the American Association of Veterinary Laboratory Diagnosticians. Minneapolis, MN.


Mats Troedsson. “Current Topics on Broodmare Management.” Conference for Veterinarians, Ohio State University, Columbus, Ohio.

Mats Troedsson. “Mechanisms of Sperm Transport and Elimination.” Ohio State University Short Course speaker, Columbus, Ohio, Feb. 6-7

Mats Troedsson. Presented research on endometritis and sperm transport/elimination, panel discussion on CEM, Society for Theriogenology/American College of Theriogenologists. Seattle. Aug. 31- Sept. 5

Mats Troedsson. Presented a paper on benefits and potential consequences of the use antibiotics in semen extenders, Minitube International Center for Biotechnology. Mt Horeb, WI. Nov. 2

Mats Troedsson. Table topic coordinator for CEM, American Association of Equine Practitioners. Baltimore, MD. Dec. 4-8


Yeargan, M. and D.K. Howe. “Modification of enzyme-linked immunosorbent assays based on Sarcocystis neurona surface antigens (SnSAGs) for improved equine antibody detection.” Special Interest Group session on EPM, American College of Veterinary Internal Medicine (ACVIM), Anaheim, CA, June


**STATEWIDE**

Note: Many of the meetings held in Kentucky were international or national conferences or symposiums.


**Robert Dwyer.** “Farm Biosecurity.” Midwest Biosafety Network Biosafety Conference, Lexington. *August*

**Robert Dwyer.** “Agrosecurity.” Department of Veterinary Science Seminar Series. Lexington. *November*

**Robert Dwyer.** General equine anatomy; front limb anatomy; hind leg anatomy; specialized anatomy; disinfecting equipment; disinfecting leather; and equine weight estimation. Presentations filmed for [http://www.thehorse.com](http://www.thehorse.com).

**David Horohov.** “Art and Science of Equine Vaccination,” Mid-America Veterinary Conference. Louisville. *Oct. 11*

**Teri Lear.** “Chromosome abnormalities in Horses” Kentucky Equine Management Internships (KEMI), Lexington. *June*


**James MacLeod.** Equine Genome Project. The 2010 Thoroughbred Pedigree and Genetics Symposium, Lexington.

**James MacLeod.** Equine Genomics. Kentucky Quarter Horse Association Annual Convention, Lexington.

**Karen McDowell.** “The Role of Caterpillars in Mare Reproductive Loss Syndrome – An Environmental Cause of Abortion.” Invited speaker at the 29th Annual Symposium for Reproductive Science and Women’s Health, Lexington. *May 20-21*

**Karen McDowell.** Participant at the International Symposium on Fungal Endophytes of Grasses, Lexington. *June 28-July 1*

**Karen McDowell.** Participant at the Symposium on Nutritional and Epigenetic Interactions. Lexington. *July 1*

**Karen McDowell.** Participant at the 10th International Symposium on Equine Reproduction, Lexington. *July 26-30*

**Edward Squires.** Presentation to the Pfizer Animal Health Technician Service Group, Gluck Equine Research Center, Lexington. *Feb. 23*

**Edward Squires.** International Chairman and Local Organizing Committee, 10th International Symposium on Equine Reproduction, Lexington. *July 26-30*

**Edward Squires.** Select Breeders Annual Meeting, Lexington. *Oct. 11-12*

**Peter Timoney.** Invited presentation at the 76th Annual Meeting of the American Mosquito Control Association, Lexington. *March 29.*

**Peter Timoney.** 10th International Symposium on Equine Reproduction, Lexington. *July 26-30*

**Peter Timoney.** 35th Annual Symposium of the Association of Veterinary Microbiologists, Lexington. *Aug. 4-7*

**Peter Timoney.** 11th Annual Meeting of Select Breeding Services Network of Affiliated Laboratories, Lexington.

**Thomas Tobin.** “The Problem Of Dietary And Environmental Substances In Equine Forensic Science.” Oral presentation at the Kentucky Derby Conference. Louisville.

**Thomas Tobin.** Invited Speaker “Chemical Warfare,” The Sound Horse Conference. Louisville. *Nov. 5-6*

**Mats Troedsson.** Local Organizing Committee, 10th International Symposium on Equine Reproduction, Lexington. *July 26-30*

**Mats Troedsson.** “Pregnancy losses: Diagnosis and Management” and “Controlling CEM with antibiotic treated semen.” Kentucky Breeders’ Short Course, Fasig-Tipton, Lexington. *January*
Thank you to our 2010 donors who generously supported the Gluck Center’s mission in improving the health and well-being of the horse.
PLATINUM

Albert and Lorraine Clay
American Endowment Foundation
Blood Horse Publications
Darley at Jonabell Farm
Estate of Hilde R. Shapiro
Florida Horsemen’s Charitable Foundation
Geoffrey C. Hughes Foundation Fellowship
Horseman’s Financial Group, Inc.
Intervet
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Edgewater Equine Clinic
Equine Medical Associates
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Kentucky Trust Company
The Klein Family Foundation, Inc.
Ms. Kristina G. Lu and Mr. Peter Morresey
Mr. and Mrs. Fred Mitchell
Dr. Edward L. Squires
Mr. Jack R. Swain III
Dr. Mats H. Troedsson

BRONZE

Miss Jane Atkinson
Dr. and Mrs. William V. Bernard
Mrs. Melissa Cantacuzene
Dr. Thomas M. Chambers
Mr. Kyle W. Cooper
Dr. Claire Latimer Embertson
Dr. Rolf M. Embertson
Mr. Mac Fehsenfeld
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Mrs. Judy P. Miller
Mrs. Betty W. Mullen
Dr. Johnny M. Smith
Mr. Lloyd Schwartz