University of Kentucky
Maxwell H. Gluck Equine Research Center

Improving the Health and Well-being of the Horse

Research Report 2011
Research Report 2011

Improving the Health and Well-being of the Horse

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Thanks to a generous donation by the Gluck family, the Maxwell H. Gluck Equine Research Center opened its doors to a new laboratory and office building to accommodate researchers from the Department of Veterinary Science 25 years ago. During the past 25 years, the Gluck Center has developed into a unique equine research unit within the University of Kentucky College of Agriculture, with internationally-recognized faculty members, research staff and graduate students devoting all their time to research that benefits the health and well-being of horses around the world.

Great accomplishments have been made by the research groups in the areas of genetics and genomics, infectious diseases and immunology, musculoskeletal sciences, parasitology, pharmacology/toxicology and reproductive health. Vaccines and diagnostic tests that are used to prevent and diagnose diseases have been developed, contributions to the sequencing of the equine genome has been made, reference standards have been established for detection of performance enhancing drugs, and causes of costly pregnancy losses have been identified and effective management and treatments have been developed.

Today we are facing continuous and new challenges in equine health and well-being with the threats of new emerging infectious diseases and bacterial resistance to antibiotics. Other issues are parasite resistance to dewormers, stricter regulations on medication for race and performance horses, an anticipated flow of genetic information through the sequencing of the equine genome, debilitating musculoskeletal injuries in the equine athlete, rapidly developing research on regenerative medicine and imminent threats to equine breeding industries by reproductive diseases and abortions. The Gluck Center is well prepared for these challenges. As the only scientific institution in the United States that has faculty working full-time on equine health issues, the Gluck Center will continue to play an important role in the horse and veterinary communities. We are looking forward to the next 25 years at the Gluck Center with confidence.

As I have stated so many times before, we could not have accomplished what has been done at the Gluck Center over the past 25 years if we did not have a devoted support from individuals and organizations within the equine community. Your financial support and contributions has been the engine that drives our research and that eventually benefits the health and well-being of our horses. Your support is more important than ever in these challenging financial times.

Thank you for your past and future contributions to our program!

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 has 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

Equine Research Hall of Fame
The Equine Research Hall of Fame, established by the
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 Ag Equine Programs (formerly 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 UK Ag Equine Program’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-three faculty at the Gluck Equine Research Center are assisted by students, post docs, research staff and visiting scientists in conducting research in the areas of:

- Genetics and Genomics
- Immunology
- Infectious Diseases
- Musculoskeletal Sciences
- 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.
GENETICS AND GENOMICS

FACULTY
Ernie Bailey, Professor
Kathryn Graves, Assistant Clinical Professor
Teri Lear, Associate Professor
James MacLeod, Professor (See page 20)

RESEARCH SNAPSHOT
Coat color genetics
Contracted foal syndrome
Cytogenetics and infertility
Dwarfism
Genetics and equine arteritis virus
Junctional epidermolysis bullosa (JEB)
Parrot mouth

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. Other interests include the 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.

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

Graduate student
• John Eberth, MS Candidate – Dwarfism

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.

Ernie Bailey, PhD
Professor

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

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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. *(Photo: Teri Lear)*

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)*

**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 chromosomal abnormalities affecting health and fertility.

**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; Lear and McGee 2011).*

**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 students and research staff:**
• Rose McGee, MS (graduated, 2011) – Disorders of sexual development in horses
• Judy Lundquist, Research Technician
• Allison Sparling, MS Candidate – Characterization of horse-specific genes

*Genetics and Genomics*

Teri Lear, PhD
Associate Professor
RESEARCH SNAPSHOT
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
*Lawsonia intracellularis* enteropathy
Rhodococcal pneumonia
Vaccine development

Education:
Postdoctoral Scholar – University of Kentucky (Equine Immunology), 2011
PhD – University of Kentucky (Veterinary Science), 2008
BS – Stephens College (Biology), 2003

Interest:
My research interests are focused on characterizing the immune system of the geriatric horse, by identifying mechanisms responsible for immunosenescence, inflamm-aging and altered immune responses to vaccination. The goal is to improve the health and well-being of the aged horse, by identifying interventions that have the potential to improve the function and redox state of the immune system. In addition, I have established research funding to further understand the effect of adiposity on the inflammatory response of the horse, in particular the equine metabolic syndrome (EMS) horse. There is a growing need to understand mechanisms responsible and pathways involved in equine metabolic syndrome. Thus, my goal is to identify potential treatments that target both the inflammatory and metabolic component of EMS.

Projects:
• Studies ongoing to determine what role nutritional intervention has on age-related changes in immune function, in particular chronic inflammation or inflamm-aging.
• Studies ongoing to develop the horse as a model system for human aging to further understand age-related changes in the immune response, in particular mechanisms responsible for inflamm-aging, focusing on T-cell membrane rafts.
• Identifying biomarkers of aging to better predict the “biological age” of the horse.
• Developing novel diagnostic tools for diagnosis of pituitary pars intermedia dysfunction (PPID) and evaluating novel treatments for PPID horses.
• Studies ongoing to characterize mechanisms responsible for Equine Metabolic Syndrome (EMS) and to identify possible treatments for EMS.
• To characterize what role gut microflora may play in inflamm-aging and EMS.
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 especially interested in infections that occur in the foal, such as *Rhodococcus equi* and *Lawsonia intracellularis*. 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)
• 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.
• 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.

Graduate students, research staff, undergraduates and visiting scientists:
• Alex Betancourt, Research Technician
• Zhangbin Gong, Visiting Scientist
• Chong Liu, PhD Candidate – Cell mediated immunity to EIAV
• Allen Page, PhD Candidate – *Lawsonia intracellularis* infection and immunity
• Lingshuang Sun, PhD Candidate – Regulation of interferon in foals
• Macarena Sanz, MS Candidate – Immunology of the young horse

Undergraduates: Courtney Carroll, Amber Simpson and Craig Stewart

Visiting Students: Jordan Dunham, MS Candidate, Wales; Lisa Tadros, PhD Candidate, University of Tennessee; Luis Prieto, PhD Candidate, University of Tennessee; and Whitney Zoll, DVM Candidate, Michigan State University
Researchers focused on infectious diseases, including:

**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
- Diagnostic test development
- Vaccine development
- Disease surveillance and reporting
- Biosecurity/Disaster preparedness

**FACULTY**
- Sergey Artiushin, Assistant Professor
- Udeni Balasuriya, Professor
- Thomas Chambers, Associate Professor
- Frank Cook, Associate Professor
- Roberta Dwyer, Professor
- Charles Issel, Professor
- John Timoney, Professor
- Peter Timoney, Professor

**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**
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 molecular diagnostic assays for rapid detection of foreign, emerging and zoonotic diseases of horses.
- 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 Center.
- Testing of clinical specimens submitted to the OIE designated reference laboratory for equine influenza infections and for equine herpes virus at the Gluck Center.
- Provide molecular diagnostic reagents to diagnostic laboratories.
- Provide advice on equine viral arteritis to veterinarians and equine industry associates over the phone.

**Graduate students and research staff:**
- Juliana Campos, MS Candidate – Genetic susceptibility of stallions to EAV
- Yun Young Go, PhD (graduated 2011) – Molecular and genomic approaches to understanding EAV pathogenesis
- Pamela Henney, Research Specialist
- Yanqiu Li, Postdoctoral Scholar – Molecular characterization of neurovirulent EHV-1
- Zhengchun Lu, PhD Candidate – EAV attachment and entry and molecular diagnostics
- Kristin Pfahl, MS Candidate – Development and validation of improved serological assays for EVA
- Kathryn Smith, PhD Candidate – Virulence determinants of EHV-1
R. Frank Cook, PhD
Associate 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:
• Debbie Even, PhD (graduated, 2011) – Manipulating immune responses to DNA vaccines in the horse

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 phylogenic 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 and research staff:
• Sanjay Sarkar, PhD Candidate – Innate immunity to equine viral respiratory diseases
• Ashish Tiwari, PhD Candidate – Innate immunity to equine viral respiratory diseases
• Stephanie Reedy, Research Specialist
• Liang Zhang, PhD (graduated 2011) – Comparative pathogenesis of equine- and equine-2 influenza viruses

INFECTIOUS DISEASES
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

Interest:
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).

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. 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. Our projects with the USDA have resulted in a DVD package that includes our video from 1996 and a new video from 2010, “Equine Infectious Anemia Testing – Refining our approach.” Both videos are available online at http://www.aphis.usda.gov/animal_health/animal_diseases/eia/. To obtain the DVD package, visit http://www.aphis.usda.gov/vs/nahss/equine/eia/index.htm.

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/.

Research staff:
• Sheila J. Cook, Research Scientist
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)

**John Timoney, MVB, MRCVS, MS, PhD**

**Professor**

**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 and research staff:**

- Rafaela De Negri, PhD Candidate – Comparative aspects of humoral and cell mediated responses of horses to infection by *Streptococcus equi* and *zooepidemicus*. Interaction of IdeE 2 of *S. equi* with equine platelets and its role in the pathogenesis of the acute phase of strangles.  
- Michael Fettinger, Research Technician  
- Sridhar Velineni, Postdoctoral Scholar – Protective immunogenicity of novel immunoreactive proteins of *Streptococcus zooepidemicus*. Temperature regulated expression of capsule, hyaluronidase and associated virulence factors in clinical isolates of *S. zooepidemicus*.  

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John Timoney, MVB, MRCVS, MS, PhD  
Professor

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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

Interest:
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/T. asinigenitalis.
• Improving control and prevention strategies for contagious equine metritis (CEM).
• Study of the epidemiology of Taylorella asinigenitalis in horses and non-horse equids.

Services:
• Responsible for OIE Reference laboratory for equine viral arteritis and equine rhinopneumonitis at the Gluck 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.
• Veterinary advisor to the Thoroughbred Owners and Breeders Association (USA).

Graduate students, research staff and visiting scientists:
• Yun Young Go, PhD (graduated 2011) – Molecular and genomic approaches to understanding EAV pathogenesis
• Jessica Hennig, MS Candidate – Studies on Equine Arteritis Virus: seasonal influences on viral shedding and neutralizing activity in semen of carrier stallions, vaccinal prophylaxis of yearling colts, diagnostic features of virus related abortion and prevalence of infection in camels
• Luisa Marenzoni, DVM, PhD, Visiting Scientist from Italy
• Barry Meade, PhD Candidate – Comparisons of the transmission dynamics of disease outbreaks attributable to neuropathogenic and non-neuropathogenic strains of EHV-1 in closed populations
• Jane Morrell, PhD, FRCVS, Visiting Scientist from Sweden
• Cecilia Pergline, DVM, Visiting Scientist from Argentina
• Kathleen Shuck, Research Analyst Principal
FACULTY
James MacLeod, Professor

RESEARCH SNAPSHOT
Articular cartilage maturation and repair
Genomics
Osteoarthritis
Wobbler Syndrome

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, areas of interest include cervical stenotic myelopathy (Wobbler Syndrome), genomics and limb development.

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

Postdoctoral/Graduate students and visiting scientists:
• Stephen Coleman, PhD (graduated, 2011) – Analysis of the equine transcriptome by mRNA sequencing, Current Position: Postdoctoral Scholar
• Rebekah Cosden, PhD (graduated, 2011) – Ambystoma mexicanium: A novel vertebrate model for diarthrodial joint development and articular cartilage repair
• Matthew Hestand, Postdoctoral Scholar – Equine transcriptome
• Jennifer Janes, PhD Candidate – Pathogenesis of cervical stenotic myelopathy
• Juipeng Liu, MS, Visiting Scientist from China – Articular cartilage maturation and repair
• Parvathy Thampi, PhD Candidate – Articular cartilage maturation and repair
• Ellen Wiegand, PhD Candidate – Articular cartilage maturation and repair
• Wenying Zhu, PhD Candidate – Osteoarthritis and intra-articular glucocorticoid therapy
RESEARCH SNAPSHOT

Drug resistance in parasites
Equine protozoal myeloencephalitis
Helminths, including life cycles, prevalence and control

FACULTY
Daniel Howe, Associate Professor
Eugene Lyons, Professor
Martin Nielsen, Assistant 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.

Postdoctoral/Graduate students, research staff and undergraduates:
• Sriveny Dangoudoubiyam, Postdoctoral Scholar – Genome of Sarcocystis neurona
• Breanna Gaubatz, MS Candidate – Genetic analysis of EPM horses
• Ablesh Gautam, PhD Candidate – Characterization of the SnSAG family of surface antigens in Sarcocystis neurona
• Xiao Xiao, MS Candidate – Analysis of serum antibodies against Sarcocystis neurona in foals
• Michelle Yeargan, Research Specialist

Undergraduate: Zijing Zhang

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.
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)*

**PARASITOLOGY**

- Seasonal and yearly transmission.
- Molecular identification of parasite species and basis of drug resistance.

**Research staff and visiting scientists:**
- Tetiana Kuzmina, PhD, Visiting Scientists from Ukraine
- Sharon Tolliver, Research Specialist

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**Education:**
Dip, EVPC – European Veterinary Parasitology College, 2011
PhD – University of Copenhagen (Equine Parasitology), 2007
DVM – Royal Veterinary and Agricultural University, 2001

**Interests:**
Diagnosis and control of gastrointestinal helminths of horses and anthelmintic resistance. Studies will aim at 1) understanding and developing new diagnostic measures of important parasites and their level of resistance to anthelmintic drugs, 2) developing and evaluating sustainable anthelmintic treatment regimens using objective measures, and 3) applying molecular approaches for understanding mechanisms for development of anthelmintic resistance.

**Projects:**
- Prepatent diagnosis of *Strongylus vulgaris*.
- In vitro diagnosis of anthelmintic resistance.
- The interaction between nematode parasites and the equine immune system.

**Graduate student:**
Ulla Andersen, PhD Candidate – Prepatent diagnosis of *Strongylus vulgaris*
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:
1981: Drugs and the perforance horse, 480 page text.
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.
2011: Certified reference and internal standards for therapeutic medication regulation, licensed to Frontier Biopharm LLC.

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.
• Develop improved assays for ergot alkaloid analysis, the group of toxins involved in fescue toxicosis.

Postdoctoral student and research staff:
• Charlie Hughes, Research Associate
• Sucheta Kudrimoti, Postdoctoral Scholar – 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.

The substance above is Myo-Inositol TrisPyroPhosphate, better known as ITPP. ITPP is considered to bind to hemoglobin and displace oxygen into muscles, thereby improving athletic performance. To enable control of this agent we have synthesized ITPP and provided certified reference standards for this substance to racing laboratories around the world to enable them to develop forensic tests and regulatory control of this substance in performance horses. (Photo: Thomas Tobin)
REPRODUCTIVE HEALTH

FACULTY
Barry Ball, Professor
Karen McDowell, Associate Professor
Ed Squires, Professor
Tom Swerczek, Professor
Mats Troedsson, Professor

Barry Ball,
DVM, PhD, Dipl. ACT
Professor and Albert G. Clay Endowed Chair in Equine Reproduction

Karen McDowell,
PhD, EMB
Associate Professor

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
Frozen stallion semen

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.

Postdoctoral/Graduate students:
•Anthony Claes, DVM, Dipl. ACT, PhD Candidate – Studies on anti-Müllerian hormone in the mare and stallion
•Igor Canisso, DVM, Dipl. ACT, PhD Candidate – Studies on placentitis and late abortion in mares
•Alejandro Esteller-Vico, DVM, PhD, Postdoctoral Scholar – Studies on endocrinology and sperm biology in the horse
•Lauren Keith, MS Candidate – Suppression of estrous in race mares

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 student:
•Drew Hestad, MS Candidate – Equine fescue toxicosis

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Edward Squires, MS, PhD, Dipl. ACT (hon.)
Professor, Director of UK Ag Equine Programs and Executive Director of the Gluck Equine Research Foundation

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.

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)
• 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)
• Factors affecting freezability of stallions (Kalmar)

Graduate students:
• Katheryn Cerny, MS Candidate – Transmission of bacteria from the stallion to the mare and its effect on pregnancy rate and embryonic losses
• Sydney Hughes, MS Candidate – Reproductive problems in late pregnancy mares
• Julianne Kalmar, MS Candidate – Factors affecting freezability of stallions

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.
REPRODUCTIVE HEALTH

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 spermatozoa 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) 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.
• Inflammation of the uterus – role of nitric oxide and inflammatory cytokines in infectious and breeding-induced endometritis.
• Causes, diagnostics and control of high-risk pregnancies.

Postdoctoral/Graduate students, research staff and visiting scientists:
• Juliana Campos, MS Candidate – EVA/disease resistance
• Alejandro Esteller-Vico, DVM, PhD, Postdoctoral Scholar – Seminal plasma proteins
• Claudia Klein, Postdoctoral Scholar – Early pregnancy recognition/genomics and gene expression and regulation in reproductive biology
• Ana Gabriella Toro Mayorga, MS Candidate – Uterine pathology/biopsies
• Kirsten Scoggin, PhD, Senior Scientist
• Elizabeth Woodward, PhD Candidate – Endometritis
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.
Gluck Equine Research Center Grants

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**

**Adams, A.A.** 2011. LAND O’LAKES PURINA FEED LLC. A New Formulation of Purina® Equine Senior® Feed: The effect on inflammatory cytokine production, oxidative status and immune responses to vaccination in old horses. (Co-PI: Horohov, D.W.)


**Adams, A.A.** 2011. USDA-ARS. The effect of Endophyte-Infected Tall Fescue consumption on epigenetic regulation of inflammation in horses. (Co-PI: Horohov, D.W.)


**Balasuriya, U.B.R.** 2011. AFRI-USDA (Matching funds will be provided by the University of Kentucky College of Agriculture). Acquisition of a FluorChem E Digital Imaging System for Arterivirus (PRRSV and EAV) Vaccine Research. $13,375.


**Cook, R.F., D.W. Horohov, C. Issel.** 2009-2014. NIH. EIAV envelope variation and vaccine efficacy. Co-PIs (PI: Montelaro, R.), $1,737,500 ($3,668,813 total).


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


**McDowell, K.J., L. Lawrence, G. Aiken, L. Bush, D.W. Horo-**
Gluck Equine Research Center Grants

**Non-Competitive Grant Funding**


**Dwyer, R.M., N. Williams, P.J. Timoney.** 2011. Lloyd’s of London. Continued funding for the Lloyd’s Equine Disease Quarterly. $45,000.


**Horohov, D.W. and A.A. Adams.** Gluck Equine Research Center. The determination of telomerase activity and its relationship with telomere length, oxidative stress and inflammation. $9,630.


**Perkins, G., K. Osterreider and J.F. Timoney.** 2012. EHV-1 strain RacH as a vaccine vector of SeM, Se18.9 and IdeE peptides of *Streptococcus equi*. $15,000.


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 2011, including books or chapters in books, refereed journal articles and non-refereed articles.

## Books/Chapters in Books


Refereed Journal Articles


**Scientific Publications**

Microbiology 154(1-2):156-162.


**Lyons, E.T.**, S.C. Toller, and S.S. Collins. 2011. Reduced activity of moxidectin and ivermectin on small strongyles in young horses on a farm (BC) in Central Kentucky in two field tests with notes on variable counts of eggs per gram of feces.
Scientific Publications


Scientific Publications


Non-Refereed Articles


Presentations/Meetings Attended

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

Ball, B.A. “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,” and “Sperm motility, morphology and viability: research with aims to improve.” Rossdales Stallion Subfertility Course, Newmarket, UK.

Cook, R.F. “EIAV immunoblot antigen production, standardization and validation,” “Choice and use of recombinant antigen for the development of diagnostic tools for EIAV” and “Overview of EIAV molecular diagnosis and research.” Presented at the request of the Italian Ministry of Agriculture during a workshop on equine infectious anemia at the Instituto Zooprofilattico Sperimentale, Della Regioni Lazio e Toscana. Rome, Italy, February


Squires, E.L. Argentina Congress on Equine Reproduction, Mendoza, Argentina. May 4-6

Timoney, P.J. Animal Health and Veterinary Laboratories Agency International Conference on Animal Diseases, Royal Holloway, University of London. Surrey, UK

Timoney, P.J. Joint FEI-OIE Meeting on International Movement of Horses. Guadalajara, Mexico

NATIONAL


Ball, B.A. “Embryonic and early pregnancy loss in mares” and “Reproductive Endocrinology of the Mare,” 48th Annual Conference for Veterinarians, University of Georgia.

Bailey, E. Participate in horse technical committee and executive committee meetings of NRSP8; poster presentations. Plant & Animal Genome XIX Conference, San Diego, CA. January

Bailey, E. Invited Speaker. Havemeyer Equine Ophthalmology Conference, West Palm Beach, FL. April 1-2

Bailey, E. “Horse Whole-Genome Sequence: Messages Written in DNA.” Department lecture at Washington State University, Pullman, WA. May 16-17

Bailey, E. Larsen Distinguished Speaker Series, “Genome Wide Association Studies (GWAS) for Horse Diseases: Opportunities and Early Lessons.” Washington State University, Pullman, WA. May 17
Presentations/Meetings Attended


Bailey, E. Poster presentation. (Panel chair, oral presentation). 9th Dorothy Russell Havemeyer Horse Genome Workshop, Minneapolis, MN. July 27-29

Bailey, E. Organize and Chair session on Horse Genetics. Conference on Equine Health on occasion of the 30th Anniversary of the Dorothy Russell Havemeyer Workshops, Saratoga, NY. Aug. 16-18

Bailey, E. “Genetics and Genomics before and after Havemeyer.” 30th Anniversary Havemeyer Workshop, Saratoga, NY. Aug. 17-20


Balasuriya, U.B.R. “Identification of virulence determinants of T953 (Findlay) strain of EHV-1: experimental inoculation of mice and horses with the cell culture adapted strains” and “Molecular Characterization of Field Strains of EHV-1.” Third Havemeyer Equine Herpesvirus-1 Workshop, Steamboat, CO. Sept. 18-23


Dangoudoubiyam, S., D.K. Howe, A. Gautam, C.L. Scharldl, J. Jaromczyk, T. Bullock, J.C. Kissinger, J. Bridgers, S. Namisivaimay. “A genome sequencing project for the apicomplexan parasite Sarcocystis neurona.” Annual Midwestern Conference of Parasitologists, South Bend, IN, June


Dunham, J., C. Liu, D.W. Horohov. “Comparison of the ability of two different adjuvants to stimulate antigen presenting cells function in vivo.” Conference of Research Workers in Animal Diseases, Chicago, IL. Dec. 3

Dwyer, R.M. Taught “Strengthening Community Agrosafety Planning” at a two-day workshop. Beulah, ND. January 9-13

Dwyer, R.M. St. Kitts for a pre-veterinary advisor tour of Ross University’s School of Veterinary Medicine. North Brunswick, NJ. March 4-9

Dwyer, R.M. FBI International Agroterrorism Conference. Kansas City, KS. April 25-29


Go, Y.Y., D. Cook, P.J. Timoney, E. Bailey, U.B.R. Balasuriya. “Genome Wide Association Study to identify the genetic determinants of susceptibility of horses of EAV infection.” The XIIth International Nidovirus Symposium. Traverse City, MI. June 4-9

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Go Y.Y., Y. Li, D. Yoo, P.J. Timoney, Y. Fang, U.B.R. Balasuriya. “Equine arteritis virus does not induce type I interferon α/β production in equine endothelial cells.” American Society for Virology, Minneapolis, MN. July 16-20


Howe, D.K., C.L. Scharld, 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


MacLeod, J.N. “Equine articular cartilage maturation and repair: new technologies and models to address longstanding research questions.” Virginia Polytechnic Institute. Blacksburg, VA


MacLeod, J.N. “Profiling gene expression across the genome: The opportunity to find the unexpected.” Havemeyer Foundation 30th Anniversary Workshop, Skidmore College. Saratoga Springs, NY


Squires, E.L. International Embryo Transfer Meeting. Orlando, FL. Jan. 8-12

Squires, E.L. Southern States Equine Feed Master. Raleigh, NC. Feb. 1-3

Squires, E.L. Equine Breeding and Management and Artificial Insemination Conference. Ohio State University, Columbus, OH. Feb. 5-6

Squires, E.L. American Quarter Horse Association Research Committee meeting. Dallas, TX. Feb. 21-22

Squires, E.L. American Quarter Horse Association Research Committee meeting and Annual Conference. Dallas, TX. March 4-7

Squires, E.L. Select Breeders meeting. Aubrey, TX. April 25-27

Squires, E.L. Equine Science Society Meeting. Murfreesboro, TN. May 31-June 4

Squires, E.L. Bioniche Annual Business Meeting. Fort Collins, CO. Aug. 1-4
Note: Many of the meetings held in Kentucky were international or national conferences or symposiums.


Howe, D.K. “Sarcocystis neurona, the Primary Cause of EPM.” Advances in Equine Neurological Diseases Symposium. Lexington

Bailey, E. University of Kentucky Endowed Chairs and Professor’s First Friday Lecture: Book review of Maryjean Wall’s “How Kentucky Became Southern.” Nov. 4


Squires, E.L. American Saddlebred Convention. Lexington. Feb. 18

Squires, E.L. Princeton Field Day. June 20-21

Timoney, P.J. Second Annual Kentucky Breeders’ Short Course. Lexington

Tobin, T. Presentation on certified reference standards synthesis. Kentucky Science and Engineering Foundation meeting. Louisville. May 26
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Thank you to our 2011 donors who generously supported the Gluck Center’s mission in improving the health and well-being of the horse.

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