UK Researcher Awarded $2.9 million for Equine Viral Arteritis Research

Udeni Balasuriya, a professor at the University of Kentucky Maxwell H. Gluck Equine Research Center, recently received $2.9 million to identify the genetic factors responsible for establishment of the equine arteritis virus (EAV) carrier state in stallions. The five-year grant was awarded by the United States Department of Agriculture-Agriculture and Food Research Initiative.

According to Nancy Cox, associate dean for research in UK's College of Agriculture and administrative leader for UK's Ag Equine Programs, Balasuriya's grant was ranked the highest in its category, unusual for a USDA grant program that normally targets food animals. This is one of the largest grants awarded in the College of Agriculture in the last year, she said, and is a special kind that includes funds for getting results out to the public in the fastest, most efficient way.

Outbreaks of equine viral arteritis (EVA) result in significant economic losses to the equine industry due to high rates of foal loss in pregnant mares, death in young foals and establishment of the carrier state in stallions. The virus is maintained in the equine population between breeding seasons by persisting in carrier stallions.

The project stems from research by a graduate student, Yun Young Go, who worked in Balasuriya's laboratory at the Gluck Center. The initial focus of her project involved the characterization of the EAV target cell population(s) in equine white blood cells. White blood cells are important because they eliminate cells attacked by the virus.

According to Balasuriya, the study demonstrated that EAV could infect isolated cultured white blood cells in the lab. “Subsequently, this study was expanded to include the latest information available from the equine genome,” he said.

The genome studies were done in collaboration with ErnieEV A, p. 4

Case Clay Named Chair of UK’s Gluck Equine Research Foundation

Case Clay, president and chief executive officer of Three Chimneys Farm, was named chair of the University of Kentucky Gluck Equine Research Foundation’s board of directors at its October meeting. Art Zubrod, manager of Brittany Farm, was named vice chair.

“Being elected chair of the Gluck Equine Research Foundation means a lot to me, as my grandfather, Albert G. Clay, was one of the founders and a board chair. My father, Robert Clay, also served on the board,” Clay said. “I will take this honor very seriously, and I am excited to work with the board to take the world’s only research facility with the majority of faculty doing full-time equine research to the next level.”

Clay joined the board in January 2010. Clay serves as a member of the Breeders’ Cup and also serves on the boards of directors of Kentucky Equine Education Project (KEEP), the Federal Political Action Committee of the National Thoroughbred Racing Association and the Kentucky Derby Museum.

“I am excited to work closely with Case as the new chair of the Gluck Equine Research Foundation. Case comes with a great knowledge of the horse industry and experience on numerous boards. This combination will provide him with the tools to be a very effective leader for the Gluck Foundation,” said Ed Squires, PhD, Dipl. ACT (hon.), executive director of the Gluck Equine Research Foundation.

“Mr. Case Clay’s leadership brings new enthusiasm combined with SPRING FEATURES
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The mission of the Gluck Equine Research Center is scientific discovery, education and dissemination of knowledge for the benefit of the health and well-being of horses.
The Maxwell H. Gluck Equine Research Center celebrated its 25th anniversary in 2012. During three memorable days in September, we inducted three new members into the University of Kentucky Equine Research Hall of Fame, followed by the 12th Mary Passenger Memorial Lecture on Equine Medicine and Surgery, and finally, an anniversary celebration and luncheon.

Speakers at the 25th anniversary luncheon were Dr. Eli Capilouto, president of the University of Kentucky; Dr. Scott Smith, dean of the College of Agriculture; Dr. Steve Conboy, the former chair of the Gluck Equine Research Foundation; Dr. Walter Zent, the then chair of the Gluck Equine Research Foundation; and Dr. Peter Timoney, the former director of the Gluck Center. A common theme amongst the speakers was an emphasis on the value the Gluck Center has contributed to the health and well-being of horses in Kentucky and around the world.

At 25 years old, the Gluck Center is an established world-class equine research institution and home to some of the brightest scientists and students in the world. A solid infrastructure has been developed for the Gluck Center in the past, and I believe that we are well prepared to meet new challenges and live up to very high expectations during the next 25 years and beyond.

In 2012, about 80 scientific articles, professional articles and book chapters on various aspects of equine health and biomedical research were authored by scientists from the Gluck Center. This represents a solid body of new knowledge on issues related to equine health and well-being that has been disseminated to veterinarians and researchers around the world. In addition, Gluck Center researchers presented their research at 170 international, national and statewide scientific and professional meetings last year. This statistic is the result of determination and hard work during long hours by our committed researchers and staff at the Gluck Center. While every article represents a large volume of work by individuals and research teams at the Gluck Center laboratories and UK Maine Chance Equine Campus, the compiled report is a reminder of the central role the Gluck Center continues to serve in the equine world.

None of this would have been accomplished without generous support from individuals and organizations within the horse community. You are all part of our team, and I hope you feel the same pride as I do. We certainly appreciate your continuous support, and we promise to continue our pursuit to maintain our leadership role in equine research at the University of Kentucky. I have no doubt that we can grow even stronger and serve the horse community and the veterinary profession well in the near and long term future with your support.

In order to further establish the Gluck Center as a world-leading equine research institution, we have developed strategic partnerships with research institutions in the United States and Europe. This will allow us to draw from expertise and strengths outside the Gluck Center, and add valuable resources to efficiently solve equine health problems as well as scientific discoveries that require substantial human and capital investments. After all, we have a common goal to improve the health and well-being of horses.

Thank you for your support. By making a donation to the Gluck Center, your gift benefits equine research, facility updates, equipment needed for research and graduate student scholarships. To donate to the Gluck Center, visit http://www.uky.edu/GiveNow/welcome.htm. Under the gift information section, first select “Agriculture” and then select “Gluck Equine Research Enrichment Fund.”

Dr. Mats Troedsson, DVM, PhD, Dipl. ACT
Gluck Equine Research Center Director
and Department of Veterinary Science Chair
M.Troedsson@uky.edu
Bailey and James MacLeod, both researchers at the Gluck Center.

Co-principal investigators of the study include eight Gluck Center faculty members—Sergey Artiushin, Bailey, Frank Cook, David Horohov, MacLeod, Edward Squires, Peter Timoney and Mats Troedsson. This collaboration includes expertise in the areas of immunogenetics, genomics, molecular virology and viral pathogenesis, equine reproduction, equine immunology, diagnostic pathology, molecular and cell biology and equine infectious diseases.

The study will further investigate the possibility that susceptibility may be different in different horses. The nature of the susceptibility will be studied first in more isolated cells in the laboratory, then later with stallions.

“This cutting edge research under the leadership of Dr. Balasuriya will use new approaches to identify genetic factors associated with the establishment of persistent EAV in stallions,” said Mats Troedsson, director of the Gluck Equine Research Center and chair of the Department of Veterinary Science at UK. “The recent sequencing of the equine genome by an international consortium, including several scientists from the Gluck Equine Research Center, has made this kind of research possible. Exploring genetic variations among horses to explain mechanisms on how they respond to viral infections is an exciting research area that is expected to not only improve our understanding of viral diseases in general, but also provide veterinarians and horse owners with new diagnostics and tools for individual management and treatments in the future.”

The study will provide research opportunities for graduate and undergraduate students to address EAV through integrating functional genomic studies and education. Findings from the studies will be disseminated through seminars and symposiums. --Jenny Evans

**GERF Chair, continued**

with strong knowledge and experience from the horse industry to the Gluck Equine Research Foundation. I am looking forward to working with Case to navigate the Gluck Center through a new era of research that benefits the health and well-being of horses in Kentucky and around the world,” said Mats Troedsson, DVM, PhD, Dipl. ACT, director of the Gluck Equine Research Center and chair of the UK Department of Veterinary Science.

Clay takes the leadership reins from Walter Zent, a veterinarian and former partner at Hagyard Equine Medical Institute, who served on the Gluck Equine Research Foundation’s board of directors from December 2000 to October.

“Dr. Zent has served the Gluck Equine Research Foundation during a time that saw a change in leadership, expansion of research facilities at Maine Chance Equine Campus as well as financial challenges during the global downturn of the economy,” Troedsson said. “His longstanding association with the Gluck Center, combined with a true compassion for advances in equine veterinary medicine and science, made him uniquely suited to lead the Gluck Foundation during this time.”

“I can truly say that Walter is one of the most passionate people about the Gluck Center that I know. He has been a great advocate for the faculty and research coming out of the center,” Squires said. “Tom (Goncharoff) was the perfect vice chair. He was never afraid to question the status quo.”

Zubrod replaces Goncharoff, manager of Crystal Springs Farm in New Mexico, as vice chair. Goncharoff has served on the Gluck Equine Research Foundation’s board of directors since December 2006. Goncharoff’s term expires in January 2015.

Gluck Equine Research Foundation directors are elected to a four-year term and can serve two four-year terms. The Gluck Equine Research Foundation was formed as a nonprofit organization to provide the exchange of information between the Gluck Center and the horse industry and to secure funds. Since the foundation’s inception, it has been highly supportive in raising funds for equine research, endowed faculty positions and facilities. --Jenny Evans

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**Gluck Equine Research Foundation Releases Fourth Research Report**

The UK Gluck Equine Research Foundation published its 2012 Research Report in late March of this year and focuses on Gluck Center faculty’s research accomplishments and scientific publications during the 2012 calendar year.

The Research Report is divided into the seven sections (genetics and genomics, immunology, infectious diseases, musculoskeletal science, parasitology, pharmacology/toxicology, and reproductive health) and includes faculty members’ educational backgrounds, interests, projects, and graduate students.

It covers Gluck Center awards and grants, scientific publications including books/chapters in books, refereed journal articles, non-refereed journal articles, and seminars and papers presented. The report also recognizes individuals and organizations who donated to the Gluck Foundation in 2012.

The Research Report is available online at www.ca.uky.edu/gluck. --Jenny Evans

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Annotating the Equine Genome

The Thoroughbred mare Twilight, whose DNA served as the basis for sequencing the horse genome, achieved world fame in 2009 when an international team of researchers published a paper in the journal *Science* analyzing her DNA. Determining the whole genome sequence provided a major leap forward in horse genetics. Now, Matthew S. Hestand, a former post-doctoral scholar at the UK Gluck Equine Research Center, is taking the next steps and asking about the information the genome contains.

Hestand’s research focus is on transcriptomics (RNA products of genes that provide templates for cells to synthesize proteins) based on next-generation sequencing of protein-coding RNA, under the supervision of James MacLeod, VMD, PhD, professor of veterinary science at the Gluck Equine Research Center. Datasets can consume hundreds of gigabytes of computer storage space and make analyses computationally intensive. Hestand’s research has continued efforts in the MacLeod lab to identify and characterize gene structures within the horse genome sequence, as well as look for differences in the genome that are found across different horses.

“To put it simply, you can think of the horse genome as a large toolbox full of tools and additional filler. At first glance, the box is a mess of tools and other items, with the initial challenging step being to identify each individual tool, or gene in our case, from the pile,” Hestand said. “We found nearly 67,000 structures, some of which represent different structures for the same gene.”

Once we can separate out a tool, we can then look at its shape and begin to learn about its function. There may be some genes that exist in multiple copies with small differences between them. These can be viewed as multiple screwdrivers that also have slight differences and hence slightly different performance such as a flat-head versus a Phillips screwdriver, to remain in the toolbox analogy, he said.

“New technology has become available and we are now basing these structures on evidence using current advanced DNA sequencing technologies,” Hestand said. “Originally, most of the gene structures in the equine genome were based on predictions. The new experimental data confirms and refines these predictions, while also providing evidence to support ‘new’ genes in the horse.”

Hestand and colleagues identified 488 genes that were similar to those found in dogs, cows, and humans, but could not be found in Twilight’s genome.

According to Hestand, identifying these structures is the first step in characterizing a gene and its function, but variations between horses also provide a list of changes in the genomic alphabet that likely have some phenotypic affect. “In our current study we also found approximately 140,000 small changes in the genome, a small subset of which may affect how a gene performs. This concept can be illustrated by established examples like some of the genes that control coat color, where one variation of a gene might control for a chestnut color and another variation might control for a black color,” he said.

As our catalog of gene structures and variations refines and expands, we will have an updated reference to identify changes across many different animals that contribute to appearance, performance, disease, disease resistance, etc., Hestand said.

Shaila Sigsgaard is a contributing writer.

Infectious Diseases and Immunology

UK Gluck Center Faculty Receives $100,000 Gift for EHV-1 Study

Udeni Balasuriya, BVSc, MS, PhD, a professor at the University of Kentucky Maxwell H. Gluck Equine Research Center, received a $100,000 gift from Wellington Equestrian Partners and Tequestrian Farms to further research equine herpes virus (EHV-1).

EHV-1 is a significant threat to the equine industry as it causes respiratory disease, abortion and neurologic diseases. Although respiratory disease causes problems for the performance horse industry due to the disruption of training or racing, it is the ability of EHV-1 to induce abortion and neurologic disease that is of most concern.

The research will focus on determining the virulence of the virus during an outbreak, give an understanding of the molecular basis of the neurologic disease, improve the techniques for diagnosis of EHV-1 and provide a basis for the development of more effective vaccines.

“We are interested in helping to fund new EHV-1 research after our experience with a false-positive case. The ongoing problems the equine community in the United States has faced with EHV-1 and its impact on the horse are a sign that more work needs to be done to understand this devastating disease,” Tequestrian Farms Owner Tom Tisbo said in a release.

The increase in incidence of variant EHV-1 strains in recent years has given rise to considerable concern to horse industries and governmental agencies responsible for equine health throughout the world. It has a major impact on movement of horses and the conduct of horse show events and can cripple an

EHV-1, p. 6

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event causing the loss of millions of dollars.

“The Tisbos approached me with the idea of helping the equestrian industry become more informed about EHV-1,” said Mark Bel-lissimo, Equestrian Sports Productions chief executive officer, Wellington Equestrian Partners managing partner and Gluck Equine Research Foundation board member. “We think a grant to the Gluck Center is a great first step and hope that with a Veterinary

Parasitology

Gluck Center Researcher Publishes Equine Parasite Control Handbook

V e t e r i n a r y practitioners, laboratory and veterinary technicians, farm managers and other equine professionals frequently request updated information on and guidance for equine parasite control. Changing recommendations and the existence of several unsupported myths make it a challenge to define a proper parasite control program.

A new book titled Handbook of Equine Parasite Control, by Craig R. Reinemeyer, PhD, East Tennessee Clinical Research in Rockville, Tenn., and Martin K. Nielsen, DVM, PhD, EVPC, assistant professor in the Department of Veterinary Science at the University of Kentucky Gluck Equine Research Cen-
ter, compiles all the available scientific material and translates it into practical updated information needed to control parasites in horses.

Both authors have spent years in equine veterinary practice before pursuing an academic career in equine parasitology. They are both board certified in veterinary parasitology and have published widely in the field.

“With increasing frequency, we had people asking for something to read to provide them with the missing information about equine parasitology. Craig and I agreed that no single publication encompassing all the needed information was out there, and that we simply had to write that book ourselves,” Nielsen said.

The book features 20 factual case stories with accompanying questions and suggested answers.

“These cases should help illustrate the concepts presented in the book, and will hopefully help the reader to digest the information. We expect that many will probably start by reading those case stories, and then use those stories to guide them to which of the 13 preceding chapters they need to read,” Nielsen said.

The handbook covers all relevant information about the parasites infecting horses and their biology as well as performance and interpretation of diagnostic methods, treatment approaches and drug resistance. It was published by Wiley-Blackwell and is available in paperback as well as ebook format. It was released in November.

Shaila Sigsgaard is a contributing writer.

Recent Study Finds Strongylus vulgaris Parasite Association in Selective Treatment

A recent study performed on American and Danish horses identified an association between selective treatment, and occurrence of the most pathogenic parasite, Strongylus vulgaris, said Martin Nielsen, DVM, PhD, EVPC, assistant professor at the Gluck Center.

Presence of S. vulgaris was significantly associated with the time since the most recent deworming. Frequent anthelmintic treatments tend to eliminate S. vulgaris completely. The results suggest that some changes to the current deworming protocols in Denmark should be considered.

A total of 991 horses representing 53 different horse farms in Denmark and Central Kentucky were under investigation. The data were subdivided based on whether or not farms were using selective therapy as a treatment strategy, and the time since the most recent deworming. The Danish results indicated a possible association between the use of selective therapy and occurrence of S. vulgaris in the individual horse and at the horse farm level in Denmark.

“We found S. vulgaris on Danish farms representing both parasite control approaches, but the prevalence was signifi-
cantly different,” he said.

The overall prevalence in Denmark was found to be approximately 12%. Farms basing parasite control on selective therapy had twice as much S. vulgaris as farms

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not basing anthelmintic treatments on fecal egg counts. Stud farms and training stables using selective therapy were particularly at risk of harboring *S. vulgaris*, which might be due to a considerably higher frequency of traffic and presence of young horses susceptible to parasite infection, Nielsen said.

However, when the most recent anthelmintic treatment had occurred less than six months ago, horses were significantly less likely to harbor *S. vulgaris*. The six month prepatency period of the parasite might explain this relation, he added. If treatment occurs within the prepatency period, the lifecycle can be effectively interrupted.

While the mean time since the most recent deworming was more than eight months on the Danish farms, the Kentucky farms were treated much more frequently with the most recent deworming occurring about three months prior to the study. This likely explains why *S. vulgaris* was not encountered in any of the U.S. horses.

According to Nielsen, the possible re-emergence of *S. vulgaris* in Danish horse establishments is most likely due to the current prescription-only restrictions of anthelmintic usage. This has lowered the treatment intensity dramatically, and has led a majority of farms to adopt the selective therapy principle. These regulations were introduced to encourage veterinary involvement and reduce further development of anthelmintic resistance as much as possible. It appears to be an unforeseen consequence that we now see *S. vulgaris* again, he said.

“The good news is that this parasite is still fully sensitive to anthelmintic treatment,” Nielsen said. “Anthelmintic resistance is a problem in other parasites infecting the horse; the cyathostomins (small strongyles) and the roundworm, *Parascaris equorum*.”

According to Nielsen, the intensive treatment regimens commonly practiced on many American establishments on one hand appear to prevent transmission of *S. vulgaris* but on the other hand have also caused the high levels of anthelmintic resistance in cyathostomins and *P. equorum*.

“We cannot completely avoid anthelmintic resistance unless we don’t perform any treatment at all,” he said.

Reduced treatment intensity, however, as represented by the selective treatment regimen, will still select for drug resistant parasites, but at a much lower rate. But the sparse treatment most commonly performed on Danish horse farms might pose a potential risk to equine health, he said.

“Overall, these results strongly indicate that the choice of anthelmintic treatment regimen represents a trade-off between anthelmintic resistance and *S. vulgaris* which are both two undesired outcomes,” he said.

Shaila Sigsgaard is a contributing writer.

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**News and Events**

**Lloyd’s of London and UK College of Agriculture Reach Partnership Landmark**

The long-standing and successful partnership between Lloyd’s of London and the University of Kentucky College of Agriculture passed a major milestone recently when financial support from the global specialty insurance market topped $1 million.

Representatives from Lloyd’s recently presented a check for $45,000 to UK, in continuing support of the Lloyd’s Equine Disease Quarterly, a research-based publication dedicated to equine health produced by the Department of Veterinary Science.

The award-winning publication includes articles written by prominent researchers from around the world and provides timely and authoritative reports on some of the most important issues facing the equine industry. The Quarterly reaches more than 18,000 readers in 93 countries. Available in paper and online, its articles are regularly reprinted in numerous scientific and lay equine publications worldwide.

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