

\$3 Million Adams Gift Benefits New ERL Facility – and More

by Coleman Cornelius



The new Bud and Jo Adams Equine Reproduction Laboratory attracts visitors on a beautiful Colorado day.

Notable Arabian horse industry leaders Bud and Jo Adams, from Scottsdale, Ariz., have donated \$3 million to the Colorado State University Equine Reproduction Laboratory to propel the teaching, research, and clinical services that have made the laboratory a foremost world authority in reproductive science and techniques.

The recently built ERL facility was officially named the Bud and Jo Adams Equine Reproduction Laboratory during a naming ceremony on Oct. 18. The lab had its grand reopening in Spring 2013, after a fire destroyed the earlier facility in 2011.

The couple said the significant donation is their way of giving back to a program that benefited their horse business, Adams Arabians, for many years. It is the family's second transformational gift to



(Left to right): Jo and Bud Adams, with sons Rick Adams and Rob Adams.

the University: Twenty years ago, Bud Adams and his late first wife, Louise, donated a barn and arena complex worth more than \$1 million. The Adams-Atkinson Arena has been a key facility, where thousands of CSU equine students have gained a unique combination of scientific and hands-on learning.

"Through the years, I've had a good relationship with the people at Colorado State University," Bud Adams said. "Jim Voss and Bill Pickett [in particular] were very helpful in my horse business. Now I'm retired, and I want to make up for some of the things that CSU did for me – to do them and other people a lot of good."

"The Adams gift will underwrite the next frontier of work in the new facility," said Mark Stetter, dean of the College of Veterinary Medicine and Biomedical Sciences. "It will shape CSU programs and the equine industry for many years to come, yielding knowledge that helps preserve valued equine bloodlines, and there's no doubt this knowledge will continue to boost our understanding of reproductive health in other animals and in people."

New Showpiece Barn

Another visible sign of the Adamses' support will be a showpiece barn built just for mares and newborn foals on the grounds of the Adams ERL. "This is something we've needed for quite some time, and we are so grateful that Bud and Jo have stepped up to make it happen," said Patrick McCue, D.V.M., the Iron Rose Ranch Chair in Equine Reproduction and senior Adams ERL clinical veterinarian.

Director's Message

from Jerry Black, D.V.M.

Dear Friends,
First of all, thank you for your support of the Bud and Jo Adams Equine Reproduction Laboratory. As we move from tragedy to opportunity, we welcome a new day for our clients, our patients, our faculty and staff, and our programs.



The new Bud and Jo Adams ERL facility allows our gifted scientists, teachers, clinicians, and dedicated staff to be more efficient and productive, keeping us at the forefront of the rapidly changing science of equine reproduction and the ever-changing needs of the horse industry.

The facility's function and design provide a space that truly reflects the Adams ERL's position as a world-class leader in equine reproduction. Within its 11,800 square feet are state-of-the-art laboratories, modern animal-handling facilities, much-needed storage areas, an efficient work-flow design, and practical vehicle access, all complemented by beautiful landscaping.

We are committed to honoring our 45-plus years of excellence in education, research, and service, while exploring fresh opportunities for outreach to the equine industry as a whole, such as our new online distance learning courses.

As we look to the future, we know that the Adams ERL will continue to provide the ultimate in reproductive care for our patients and clients, and will remain on the cutting edge of the development of pioneering reproductive technologies used globally to benefit both horses and humans.

Jerry Black, D.V.M.

Director, Bud and Jo Adams Equine Reproduction Laboratory
Wagonhound Land & Livestock Chair in Equine Sciences

Recent Gifts Expand Research and Programs

Our humble appreciation is extended to those people whose recent generosity has helped to grow our programs, expand research, and more. Whether the gift was large or small, we are grateful for each one.

Distance Education Program – One of our most ambitious goals is to provide excellent education in equine reproduction to a worldwide audience of horse owners, breeding managers, and veterinarians. One recent gift will provide the foundation for a sustainable distance education program. Initially, we will focus on horse reproduction and newborn foal care. Eventually, we intend to cover many other aspects of horse health care. The ultimate goal is to reach beyond traditional classroom walls to extend equine education to horse care providers across the country and around the world.

Bud and Jo Adams ERL Facilities – We greatly appreciate the outpouring of support from the equine community following the devastating loss of our main ERL

building in 2011. Many donations, both large and small, were received. Thanks to those and other efforts, we've been able to rebuild and continue to conduct research, provide clinical services, and expand education and outreach.

Equine Reproduction Research – Two significant recent donations were specifically directed to support research in



equine reproduction. The Adams ERL's long history of groundbreaking research, which often translated into clinical applications benefiting horses on a global scale, continues with the sure promise of an even brighter future.

Circle Y Ranch Funds New Lab

A generous donation from the Circle Y Ranch, Millsap, Texas, has secured the initial launch of the Bud and Jo Adams ERL's new, cutting-edge Molecular Biology Laboratory. Very special thanks go to Penny Youngblood and Nancy Pearce, owners of the ranch.

"We sincerely appreciate the generous gift from the Circle Y Ranch that will enable us to equip and run our new Molecular Biology Laboratory," said Dr. Jerry Black, director of the Adams Equine Reproduction Laboratory. "Our goal is to have a state-of-the-art laboratory to be used for advanced research in the detection and identification of infectious repro-

ductive pathogens of horses and myriad other research endeavors."

Added Dr. Patrick McCue, "We firmly believe that molecular biology is the new frontier in reproductive research, and we hope to translate that to clinical practice to benefit all horses."

Circle Y Ranch is known for its premier cutting horse program. In a joint statement, the ranch owners said, "During a visit to the ERL last spring, our attention was brought to the need for a state-of-the-art molecular research lab and, as horse breeders, we knew that it was an extremely important place for us to put our resources. It was a very easy decision."

ART Research Update:

Making Assisted Equine Reproduction More Accessible and Affordable

By Kerri McDermid, CSU Communications Specialist, ARBL



Researchers at CSU's Bud and Jo Adams Equine Reproduction Laboratory have been successfully producing foals, but a new method championed by Dr. Elaine Carnevale promises to make the process available to a wider group of horse owners and breeders.

For the first time, Carnevale and her research staff have been able to successfully perform an equine intracytoplasmic sperm injection and implantation without the need for a surrogate mare. (Also involved in the project were Dr. Jacobo Rodriguez, JoAnne Stokes, and Dr. Patrick McCue.)

"This new process makes ICSI much more accessible and affordable for people to continue the legacy of some of these really valuable stallions," said Carnevale. "We can still produce offspring – even with poor sperm quality or limited supplies – but at about a quarter of the cost."

Traditionally, when ICSI is performed, oocytes are collected from a donor mare, injected with sperm, and implanted into a recipient mare. Carnevale's new method eliminates the need for a recipient mare, because embryos are implanted back into the original donor mare on the same cycle.

Carnevale has already successfully performed this new technique on three mares from a client in Colorado – two were successful on the first cycle, and the third on the second cycle. Sperm used came from two stallions no longer available for standard breeding. The mares went home after a 35-day follow-up period, with foals expected in the spring.

The new method shows great promise, but still isn't the best for some horses. A healthy donor mare capable of carrying a pregnancy to term is necessary for this method to work well.

"We couldn't use this method on a mare that was unable to carry a pregnancy due to an abnormal uterus," said Carnevale. "However, it would be interesting to use on mares who had trouble getting pregnant because of cervical issues – this could let them have a pregnancy and hopefully help loosen the cervix to make them more fertile in the future."

In addition to her research program, Carnevale heads the clinical program in advanced equine assisted reproduction techniques – known as ART for short – allowing for the clinical application of new developments and training in advanced procedures.

Working with Dr. Carnevale

Dawn Bresnahan –
Postdoctoral Research
Associate

Degree: B.S.A., animal science, University of Georgia; M.S., reproductive physiology, University of Kentucky; Ph.D., reproductive physiology, University of Kentucky
At the Bud and Jo Adams ERL: Bresnahan's research primarily focuses on the impact of maternal obesity on fertility; specifically, the role obesity and equine metabolic syndrome has on ovarian follicles and oocytes. She is also studying the role of obesity on fat metabolism and inflammation in uteri and embryos potentially contributing to health effects in offspring.



Jenn Hatzel, D.V.M. –
Postdoctoral Fellow

Degrees: D.V.M., Western University of Health Sciences (2007); M.V.S., University of Florida (2011); Diplomate, American College of Theriogenologists
Internships/Residencies: Rotating equine internship, Peterson and Smith Equine Hospital, Ocala, Fla.; Neonatal Internal Medicine Fellowship, Hagyard Equine Medical Institute, Lexington, Ky.; residency in equine reproduction, Colorado State University; recently passed the board exam to become a Diplomate, American College of Theriogenologists
At the Adams ERL: The research Hatzel conducted during her residency, was focused primarily on the equine fetomaternal relationship. More specifically, a tiny protein thought to be produced by the embryo and its effect on the mare's reproductive tract. In the future, she anticipates continued research and clinical work revolving around the equine oocyte and culture of early embryos.



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AQHA Grant Further Advances Pregnancy Research

Working with Wild Horses

Dr. Jason Bruemmer and crew recently returned from North Dakota, where they were doing valuable research work with wild horses. Their efforts and research details will be highlighted in future newsletters and on CSU's website for the Department of Biomedical Sciences/Bud and Jo Adams Equine Reproduction Laboratory.

Research under investigation by Drs. Jason Bruemmer and Gerrit Bouma, “Focal Adhesion Molecules as Regulators of Maternal Recognition of Pregnancy in the Mare,” benefited from a recent American Quarter Horse Association grant.

In mares, the mechanism for maternal recognition of pregnancy remains unknown. It is well established that prostaglandin production by the mare’s uterus must be altered in order to avoid luteolysis and ensure progesterone production. Likewise, it is understood that embryo contact along at least 80 percent of the uterine surface between days

10 and 15 post-ovulation results in the aforementioned prostaglandin production decrease.

What remains elusive is the manner in which the embryo conducts this signal at the cellular and molecular levels. Special molecules, called focal adhesion molecules, can trigger intracellular responses following extracellular, physical contact. We, therefore, hypothesize that maternal recognition of pregnancy is triggered through actions of focal adhesion molecules located within the equine uterus.

This hypothesis is being tested by collecting uterine biopsies and early embryos and using a co-incubation culture system. First, molecular techniques are being used to assay the biopsies to determine the location of focal adhesion molecules in samples already acquired from pregnant and non-mated mares at days 11, 13, and 15 post-ovulation.

Second, uterine tissue is being co-incubated with early embryos to determine whether focal adhesion molecule quantities and location changes, as well as whether prostaglandin production is altered due to the contact with the embryo.

Results from this proposed research may provide novel insight and identify the mechanism of maternal recognition in the mare. This discovery will greatly benefit the equine industry and has implications for fertility control in wild horses, as well as pregnancy losses.



Wild horses. Photo credit: Elissa Kline

Grayson-Jockey Club Funds Aid Biofilm Research

Mares with repeated bacterial infections of the uterus may be infected with pathogenic organisms that produce biofilms. Consequently, a common treatment protocol is to infuse medications into the uterus to eliminate potential biofilms. However, actual biofilm production from bacteria isolated from the equine uterus have not been evaluated or characterized, and the therapeutic efficacy of empirical treatments has not been reported.

Dr. Ryan Ferris and Dr. Brad Borlee received funding from the Grayson-Jockey Club Research Foundation to evaluate the role of biofilms in endometritis. The research is designed to determine the type of bacteria isolated from the equine uterus that produce biofilm, identify genes associated with production of biofilm, and evaluate the efficacy of

currently recommended uterine treatments to disrupt biofilms.

An increased understanding of biofilm production and therapy would allow equine practitioners to provide validated treatments for biofilm-producing bacterial pathogens and for horse owners to receive a higher level of care, which will hopefully translate into increased pregnancy rates and live-foal rates.

Future studies, based on results of this initial proposed research, will focus on identification of a biomarker for the presence of biofilm, either from the components themselves or a genetic marker based on bacterial DNA. Ultimately, these studies will lead to improved diagnostic tests and therapeutic strategies for management of mares with uterine infections caused by biofilm-producing bacteria.

Molecular Diagnostics:

Shedding New Light on Old Topics



Success with problem quarter horse mare.

A 12-year-old quarter horse mare was brought to the Bud and Jo Adams ERL because she failed to become pregnant after five breeding attempts the previous season. The breeding soundness examination performed included a direct culture (two swabs), cytology, and a low-volume lavage. One of the two culture swabs was submitted for culture; the second was saved for a novel broad range 28S qPCR assay (real-time

PCR or quantitative real-time PCR) for fungal DNA that was developed at CSU's Adams ERL and James L. Voss Veterinary Teaching Hospital.

The traditional microbial culture was unable to cultivate bacterial and/or fungal organisms, but the qPCR assay was positive for *Candida guilliermondii* – a type of yeast. The low-volume lavage cytology had three-five yeast organisms visible per high-power field (400x), with significant white blood cells present as well. Treatments for the mare consisted of uterine lavage with dilute acetic acid, insertion of a miconazole ovule insert (Monistat-1™), and intrauterine administration of nystatin (special antifungal antimicrobial) daily for six days.

The mare was artificially inseminated with two doses of cooled-shipped semen on the next estrous cycle. At the 14-day exam, the mare was diagnosed as pregnant with a 15 mm vesicle that then grew and had a heartbeat by 25 days. The mare was sent home and is expected to foal next spring.

This case highlights the need for evolving diagnostic techniques and modalities for those mares with prolonged infertility and a clinical suspicion of uterine disease. – *Ryan Ferris, D.V.M.*

Salvaging Hope

The Unexpected Death of a Stallion

The colic started about 10 in the evening. At first, it was just occasional pawing at the ground, but soon progressed to violent rolling. The local veterinarian quickly realized the situation was critical. An hour later, the stallion was in surgery, during which a large colon torsion was diagnosed. Unfortunately, despite intensive medical intervention, the horse died on the surgery table.

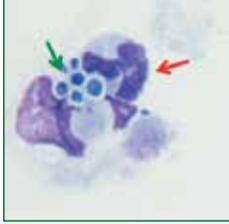
Just 8 years old, the stallion was royally bred, exceptionally fertile, smart, kind, and gentle – a horse small children could ride and dote on. The all-American horse. Gone.

A suggestion was made to the owner that there was still an opportunity to harvest spermatozoa from the horse, even after death. The testes and associated epididymides (sperm storage sites)

were harvested and brought to the Adams ERL. The epididymides were dissected free and flushed with seminal plasma previously collected from a normal, healthy stallion. Approximately 96 billion spermatozoa were recovered, processed, placed into straws, and frozen. A total of 105 breeding doses were salvaged, even after the stallion had died.

It was a bittersweet, yet important epilogue to the death of a valuable horse. Like many people, the owner presumed the stallion would live for years, and there would be plenty of time later to stockpile frozen semen. The take-home message for all owners and breeding managers is that it is never too early to collect and freeze semen from your stallion. But sometimes, it is too late.

– *Patrick McCue, D.V.M.*



What the assay showed: The red arrow points at a neutrophil, or white blood cell, that indicates inflammation or infection in the uterus. The green arrow highlights a small cluster of yeast organisms.

Reaching Out Through Continuing Education

Reproduction Course – The ever-popular main reproduction course will again be held in early January 2014, at the Bud and Jo Adams ERL. This course has traditionally attracted people from all across the country.

Foaling Course – The foaling course held in Texas last January was so popular, we are doing it again. The next date is Jan. 18, 2014, at North Central Texas College, Gainesville, Texas.

A first-ever **Ranch Owner Forum** was held at the Adams ERL in 2013, and was so successful that a second event is planned for 2014. Watch for date and details.

Online Distance Education – Thanks to a donation from Cathy Carpenter Dea of Denver for special equipment, the Adams ERL is set to launch a webinar series, on various aspects of breeding and reproduction. Those interested can send an e-mail to the Adams ERL office to sign up: erl@colostate.edu.

The People Who Serve You

ADMINISTRATION

Dr. Jerry Black, Director, Bud and Jo Adams Equine Reproduction Lab and Wagonhound Land & Livestock Chair in Equine Sciences

Dr. Patrick McCue, Iron Rose Ranch Chair in Equine Reproduction and Senior Adams ERL Clinical Veterinarian

Dr. Thomas R. "Tod" Hansen, Traubert Professor and ARBL Director

Kay Gallatin, ARBL/Adams ERL Business Manager

Leslie Butler, Adams ERL Office Manager and Accounting

Lindsay Bass, Client Coordinator

Ruth Hurst, Reception

FACULTY

Gerrit Bouma, Ph.D., Associate Professor of Reproductive Biology

Jason Bruemmer, Ph.D., Associate Professor of Animal Sciences

Elaine Carnevale, Ph.D., Associate Professor in Department of Biomedical Sciences

Colin Clay, Ph.D., Reproductive Biologist, Professor, and Head of Department of Biomedical Sciences

David Denniston, Ph.D., Associate Professor of Animal Sciences

Ryan Ferris, D.V.M., Assistant Professor in Department of Clinical Sciences

James Graham, Ph.D., Professor in Department of Biomedical Sciences

George Siedel, Ph.D., University Distinguished Professor in Department of Biomedical Sciences

DN Rao Veeramachaneni, Ph.D., Professor of Reproductive Biology

INTRODUCING

Brittany Bayer – Research Associate

Degree: B.S. in animal science, University of Arizona, emphasis in equine industry

Internship: CSU Bud and Jo Adams Equine Reproduction Lab (2010)

At the Bud and Jo Adams ERL: Bayer is an integral part of the embryo transfer program, working with Dr. Ryan Ferris and Dr. Patrick McCue and helping to manage health and breeding needs for client mares, general herd health for recipient mares, and care for newborn foals. She is also heavily involved in teaching short courses that the Adams ERL offers for mare owners and veterinarians.

Chelsie Burden, D.V.M. – Resident (second year)

Degrees: B.S. in animal sciences and industry, Kansas State University; D.V.M., Kansas State University; (in progress) M.S. in clinical sciences, Colorado State University.

Internship: Oklahoma City Equine Clinic
At the Adams ERL: Burden's focus this year is centered on routine breeding and embryo transfer management, foaling management, and neonatal care. She also



is involved in clinical research throughout the year, currently focusing on hormone manipulation in the mare, the resulting physiologic effects, and potential clinical applications.

Hannah Buzan – Equine Breeding Intern

Degree: B.S. in animal sciences, University of Missouri-Columbia

At the Adams ERL: Buzan began her equine career as a volunteer at the University of Missouri Equine Teaching Facility. She was promoted to undergraduate assistant manager of its breeding farm from the summer of 2012 to the summer of 2013, before moving to Fort Collins for her Adams ERL internship.

Laura Bylina – Master's Graduate Student

Degree: B.S. in animal science/pre-veterinary science, University of Connecticut

At the Adams ERL: Bylina's research deals solely with the stallion reproductive tract, and the project she is currently working on is "Toxic Seminal Plasma" with Dr. McCue as her adviser. She also actively participates in client stallion collections and evaluations.

Kristen Loncar, D.V.M. – Resident (first year)

Degrees: B.S. in animal science, Califor-



nia Polytechnic State University, San Luis Obispo, Calif.; D.V.M., Western University of Health Sciences, Pomona, Calif.

Internship: General equine practice, Equine Services, Simpsonville, Ky., (2012-2013)
At the Adams ERL: Loncar is studying biofilms in the uterus and looking for novel treatments to aid us in clearing them. She is focusing primarily on non-antibiotic treatments, such as ozone therapy, as an alternate approach.

Lindsay Bass – Client Coordinator
Degrees: B.S. in equine science; M.Ag. in Extension education and equine reproduction, both from Colorado State University.

At the Adams ERL: We offer a special welcome to this new kid on the block! Bass will assist the core Adams ERL faculty with client communication in order to provide each client with the most accurate and up-to-date information regarding his or her horse. Additionally, she will be assisting in the continued computer management transition and will aid with any additional training our staff might need.



Working with Dr. Carnevale, continued from Page 3

Jacobo Rodriguez, D.V.M. – *Research Associate II*

Degree: Veterinary degree, La Plata University, Argentina.

Master's degree, animal science, Washington State University. Board certified in theriogenology
Internship: Equine medicine and surgery, Chino Valley Equine Hospital, California. Residency in large animal theriogenology, Washington State University

At the Adams ERL: Reproductive evaluation of recipient and donor mares for assisted reproductive techniques and on cryopreservation of sperm for ICSI.

Elena Ruggeri – *Ph.D. Student*

Degree: M.S. in veterinary biotechnologies, University of Milan, Italy

Internships/Residencies: Reproduction Technology Laboratory, AVANTEA srl, Cremona, Italy (2006-2007); Trainee fellowship, Department of Veterinary Clinical Sci-



ences, Section of Obstetrics and Gynecology, Faculty of Veterinary Medicine, University of Milan, Italy (2006-2009); Internship, Colorado State University, Animal Reproduction and Biotechnology Laboratory, (2009-2010)

At the Adams ERL: Ruggeri's main research projects are the effects of aging and vitrification on meiotic spindle morphology in equine oocytes; cytoskeleton analysis using confocal microscopy of ICSI-produced oocytes that failed to fertilize; and effects of oocyte in vitro maturation in young and old mares.

JoAnne Stokes – *Research Associate*

Degree: B.S. in dairy science, Ohio State University

At the Adams ERL: Stokes is a valuable member of the ART program, primarily helping out with the clinical and research programs by performing the intracytoplasmic sperm injection procedure and lab organization. Her research is focused on improving cryopreservation of in vitro-produced embryos.



2012-2016 Adams ERL Advisory Board

The Bud and Jo Adams Equine Reproduction Laboratory Advisory Board provides valuable input to the Adams ERL on research, outreach, and educational programs. Its members meet annually to discuss issues and provide insight and guidance to the Adams ERL. Board members also serve as ambassadors for the Adams ERL to the greater horse community. We deeply appreciate the time and commitment extended by these dedicated board members:

- Ed Blach, D.V.M.;** veterinary consultant – Monument, Colo.
- Gail Holmes;** quarter horse owner and breeder – Fort Worth, Texas
- Paul Loomis;** Select Breeders – Chesapeake City, Md.
- Phil Matthews, D.V.M.;** equine veterinarian – Ocala, Fla.
- Michael Miola;** reining horse owner and breeder – Scottsdale, Ariz.
- Philip Rapp;** quarter horse owner, breeder, and trainer – Weatherford, Texas
- Kirk Shiner, D.V.M.;** equine veterinarian – Windsor, Colo.
- Sam Shoultz;** quarter horse owner and breeder – Bellvue, Colo.
- Charles Scoggin, D.V.M.;** equine veterinarian – Paris, Ky.

Colorado State University Bud and Jo Adams Equine Reproduction Laboratory

Yes! I/we would like to support the work of the Adams Equine Reproduction Laboratory.

Enclosed is my/our check for a gift of:

\$50 \$100 \$200 Other \$ _____

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A matching gift form is enclosed.

Charge this gift of \$ _____ to my/our

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Please return this form with your gift to: CSU Foundation,
P.O. Box 1870, Fort Collins, CO 80522-1870



Adams ERL: On Air!

RFD-TV Show Shot at Adams ERL

by Coleman Cornelius

It was lights, camera, action at Colorado State University's famed fertility clinic on July 9, as a crew from agriculturally focused RFD-TV visited to film an hourlong show about horse reproduction, which was broadcast nationwide Sept. 19. *Managing Your Mare* is sponsored by Merck Animal Health and features CSU's Bud and Jo Adams Equine Reproduction Laboratory and its experts. The cable-television program – addressing mare care from pre-pregnancy through foaling – features a panel discussion with a studio audience of dedicated Colorado clients of the Adams Equine Reproduction Laboratory. For more information on viewing the show, please go to the Adams ERL home page or www.rfdtv.com.



Horse Sense Continues to Gain Popularity

Horse Sense: A Short Documentary showcases CSU's equine programs and highlights its national and international contributions to the equine industry. Much of the credit for the production goes to Cathy Carpenter Dea of Denver and Chapman University's Dodge College of Film and Media Arts. Colorado Gov. John Hickenlooper narrates, and its television debut was on Rocky Mountain PBS. The film can be viewed or downloaded from the Bud and Jo Adams ERL home page or from www.horsesensedocumentary.com.

Mission Statement

Bud and Jo Adams Equine Reproduction Laboratory

The Bud and Jo Adams Equine Reproduction Laboratory is committed to pursuing excellence in education, performing innovative research, and providing outstanding clinical service to the horse industry.

Elements Key to the Mission:

- **EDUCATION:** Excellence in education for undergraduate, graduate, postdoctoral, and professional veterinary medicine students
- **RESEARCH:** World-class programs of basic and applied research in the mare and stallion
- **CLINICAL SERVICES:** Dedication to horse health and clinical service
- **OUTREACH:** Dissemination of knowledge through continuing education

