



A Year in Review

July 1, 2010 - June 30, 2011

Celebrating the 10th Anniversary of the
Rutgers Equine Science Center

For the love of horses

Equine Science Center New Jersey Agricultural Experiment Station Rutgers, The State University of New Jersey



MESSAGE FROM THE DIRECTOR

Throughout 2011 the Rutgers Equine Science Center celebrated its tenth anniversary. Since 2001, the Center has established itself prominently within the state, nationally and internationally through its thoughtful business plan, research and outreach programs, partnerships with state and federal agencies and private entities, dynamic website, and the widespread recognition and acknowledgement it has received as a result of the impacts of its programs. Undergraduate and graduate students who have participated in these programs have gained valuable experience which yields a high success rate of acceptance into veterinary and graduate programs in addition to producing students with skills needed to better manage horse care in the industry.

The mission of the Equine Science Center - **“better horse care through research and education to advance the well-being of horses and the equine industry”** - hasn't changed since 2001. Center research programs utilize the expertise of multi-disciplinary, interdisciplinary and inter-institutional teams of faculty and staff which result in measurable outcomes and impacts.

The Center has many reasons to celebrate as we move into the next decade. We are taking commitment to new heights, and have initiated an ambitious \$6.5 Million campaign to expand our faculty, research capabilities, programming and outreach. I invite you to come visit, spend time with us, explore and learn about the pivotal role your gift can play in training new generations of knowledgeable, passionate equine advocates and specialists.

The Center continues to be competitive for grants, contracts and donations. For the period July 1, 2010 – June 30, 2011, Center core animal science faculty and staff have procured \$150,000 in extramural funding and \$249,380 in donations and gifts. Since, Strategic Initiative dollars, which provided seed money that was leveraged into large, impactful projects is no longer available, the Center, facing financially critical times, may be hindered in its ability to conduct cutting-edge research which is translated into language that people, such as policy makers, can understand and use.

The Equine Science Center has gained the respect and credence of equine enthusiasts in the Garden State and beyond. The New Jersey horse industry relies on the Equine Science Center to fill a unique role that beckons the support of the industry because it:

- Speaks for the entire horse industry
- Provides credibility for the horse industry
- Has no hidden agenda
- Is the sole source for programming to ensure the industry's viability and vitality
- Is the place of education for the future leaders of the horse industry

With your partnership and generous support, the Equine Science Center looks forward to another decade of excellent service to the horse industry.

CENTER OVERVIEW

A unique equine academic environment.

The Equine Science Center at Rutgers, The State University of New Jersey, is the only academic entity in the country that assembles faculty, students and staff from multiple disciplines and departments, both from within and outside the university. Together, our expert collaborative teams address, research, and provide solutions for challenges facing horses, horse owners, and the horse industry.

A visionary history.

In 1978, a group of visionaries at Rutgers University believed that horses were the future of the livestock industry in New Jersey. Based on keen observation of changes in the industry, a formal equine sciences program was established within the Department of Animal Sciences at the School of Environmental and Biological Sciences (formerly Cook College).

Initiating an equine science minor proved to be remarkably prescient, as today; New Jersey's equine industry has become a dominant force in agriculture, and a key component in open space and farmland preservation in the state.

In 2001, the Rutgers University Board of Governors recognized the excellent science, teaching, and extension components of the equine program by declaring the Rutgers Equine Science Center an official Center within the university.

A center for advanced learning in large animal sciences.



As the rural landscape of New Jersey changes, fewer young people with interest in animal and veterinary sciences have sufficient exposure to large animals. However, our graduates are consistently recognized by veterinary schools for the experience with large animals they receive at the Equine Science Center. As a result, a remarkably high percentage of our students are accepted by veterinary schools, and we are proud to note that many have gone on to become practicing large-animal veterinarians.

A center for discovery, practical research and applied science.

The Equine Science Center is a hub for mission-oriented, practical research - a critical component in examining and solving equine-related issues. In addition to ongoing research in fundamental equine subjects, some of our recent research topics include the role of natural food products for use in horses; enhancement of immune function in all horses; care and management of young and older horses; how specific bacteria might influence the development of laminitis; and the role of horses in the environment.

A center dedicated to public outreach and industry values.

The Equine Science Center emphasizes outreach as a critical value, and we consistently share the results of our research with the public and the equine industry. We are vigilant in reaching out to the equine community in a number of different ways, including our annual Stakeholder's Meeting and the Equine Science Update; programs through the Rutgers Cooperative Extension offices in each of New Jersey's 21 counties; a popular 4-H Youth Development program; and a series of horse management seminars and workshops as well as equine courses open to the public through the Office of Continuing Professional Education.



We also reach out online (esc.rutgers.edu) with features including our 'Ask the Expert' page, advanced webinars and podcasts, and virtual tours brimming with valuable information. We have also launched "Equine Science 4 Kids," an online classroom featuring games, interactive activities, and a little horseplay for children of all ages.

Leadership and recognition.

Since 2001, The Equine Science Center has earned commanding levels of respect amongst equine enthusiasts in New Jersey, nationally, and internationally. In cooperation with our multi-disciplinary team of faculty affiliates, we have garnered widespread recognition, taking our place at the forefront of needs-based equine research, teaching, and outreach – all supported by generous public and private partnerships.



A vision for the future.

In the course of a single decade, the Equine Science Center has become vital to the future of the horse industry. As the sole source for research and extension programming, we not only educate leaders, but also ensure the entire industry's viability, visibility and vitality.

Our vision for the next ten years is to provide global leadership in all things equine - to sustain and support the horse industry, and to maintain our status as a primary resource for equine health, management, science and policy. We also plan to continue promoting the linkage between a viable horse industry and the preservation of open space and farmland.

The Center's website continues to be a potent marketing tool for sponsors, donors, and prospective students, in addition to its more traditional role as an educational instrument and resource center. In fact, one of the top ten pages visited is the fact sheet describing the SEBS Equine Sciences minor.

Website traffic is phenomenal. From July 1, 2010 – June 30, 2011, the Center's website received:

- 3.4 million hits
- Over 700 visits per day
- 122,200 unique visitors
- 20,691 return visitors
- An average page view length of 76 seconds

The Equine Science Center also serves as an important element of the SEBS teaching program. The Center took the lead in the development of two new courses which focus on horse health and horse industry leadership. The first, "**Advanced Equine Health Care and Management**," is a semester-long program whereas the second is a two-day short course on "**Developing Future Leaders for the Equine Industry**." Both courses are open to adult learners and continuing education students. These courses, which were made possible by the efforts of the Center, brought enhanced revenue to the Department of Animal Sciences and the Center.

In addition, two of the core courses, Horse Management and Equine Nutrition, are offered on-line and in the class room to non-matriculated students through the Office of Continuing Professional Education, providing the opportunity for both experienced and inexperienced horse owners/trainers/breeders, not only locally but as far away as New Zealand, to update or gain new knowledge on how best to manage and feed their horses.

Three Center faculty members, who reside in the Department of Animal Sciences, are pivotal to the success of undergraduates who gain hands-on experience by participating in independent research in the exercise physiology lab and the Young Horse Teaching and Research Program. Over the past three years these core faculty members provided research opportunities to 197 students and generated 463 credit hours valued at over \$140,000 in tuition. In 2011 alone, 19 Animal Science Pre-Vet applicants, 5 of whom were involved with the equine program, were accepted to at least one veterinary school in the U.S. and abroad.

On the extension and outreach side, the Center developed two virtual tours which are available on the website. One is a tour of the Ryders Lane Environmental Best Management Practices Demonstration Horse Farm and the other is a tour of the Equine Exercise Physiology Lab. Both virtual tours are available on the Multi-Media page of the Center's website.

On July 21, 2010 the Governor's Advisory Commission on New Jersey Gaming, Sports and Entertainment released its recommendations to the governor in a report which did not address the importance of the Standardbred industry to the state. The Center issued a response to the report, which was posted on the Hall Institute of Public Policy of New Jersey's website. The response was so overwhelming from the media that Center director Malinowski conducted 45 radio, television, and press interviews in under a week. In the months following the release of the report from the

As a result of the renewed interest in the future of horse racing in New Jersey, we added a new section on racing to the Center's homepage. Visitors will find links to the Center's "*The New Jersey Equine Industry 2007: Economic Impact*," economic impact study of the horse industry, the "*Impact of slot machines/video lottery terminals (VLTs) on the economy, horse racing and breeding industry, agriculture and open space in states/provinces where they exist: Why is this important for New Jersey?*" report, released in July 2009, and other testimony, written remarks and Power Point presentations given by Malinowski at numerous discussions which ensued regarding racing's future. Efforts by the Center in cooperation with horse industry leaders resulted in the successful lease to private parties for both the Meadowlands Racetrack and Monmouth Park.



EQUINE SCIENCE 4 KIDS!

HEALTHCARE & NUTRITION • HORSES & THE ENVIRONMENT • EXERCISE PHYSIOLOGY







Welcome to Equine Science 4 Kids!

Would school be more fun if there were horses in your classroom? How about horses in your gym class? And even in your lunch room? Hey, it's not a dream! It's the Rutgers Equine Science Center. We go to school with horses every day! We've learned a lot about keeping them happy, healthy and strong, and keeping their environment clean. And now you can too. Just saddle up and click around!

OUR MISSION

The Equine Science Center is dedicated to better horse care through research and education to advance the well-being and performance of horses and the equine industry.

COOL CLICKS

[See Lord Nelson's bio](#)
[Holy Hoofprints blog](#)
[Join the fanclub](#)



GET WALLPAPER!

A TYPING HORSE?!

Question about horses?
We've got answers!

Email Lord Nelson your questions!

Please include your first name, age & state

Check this out!

New Game: Fun on the Farm

Just being best. Fun on the Farm features an illustrated version of the game.

NJAES HOME

EQUINE SCIENCE CENTER HOME

SITE SURVEY

Rutgers University Board for Equine Advancement

In 1992, a committee of stakeholders representing various equine interests formed the Equine Advisory Committee to support the School of Environmental and Biological Sciences formally known as Cook College. The committee secured from the New Jersey Legislature an allocation of \$1.2 million in uncollected pari-mutuel winnings for the New Jersey Agricultural Experiment Station – of which \$300,000 was used to support equine research and the facilities and operations of the Equine Science Center. (Subsequently, \$900,000 in funding to the Experiment Station for Strategic Initiatives was made a line item in the state budget; since fiscal year 2010 the state has not funded this line item). The Equine Advisory Committee evolved into a more formal advisory group, the Rutgers University Board for Equine Advancement (RUBEA). Over time the goals and composition of the board have been modified as required.

Membership on the board, once drawn from a wide spectrum of equine organizations in the state, was redefined to emphasize individuals and organizations which impact the horse industry, not only in New Jersey but nationally and internationally, and have the desire and wherewithal to assist the Equine Science Center in meeting its fund-raising goals. RUBEA hopes this expanded function will make it as effective as possible in promoting the status and progress of the Equine Science Center and assuring its continued vitality.

Officers:

Sandra M. Denarski, **Chair**

David Meirs II, VMD, **Chair Emeritus**

Taylor Palmer Jr., **Chair Emeritus**

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Richard A. Wills

Report on Major Programs

Equine Science Center Research and Outreach

Horse Health and Well-Being

Effects of Age and Training on the Cytokine, Myokine, and Endocrine Regulation of Glucose Metabolism in Standardbred Mares: Use it or Lose it!

This research, by Nettie Liburt in Kenneth McKeever's lab, investigated the effects of age and exercise training on the stress response and glucose metabolism in Standardbred mares. Age has been shown to disrupt endocrine and cytokine functions involved in the control of the "stress response." (Cytokines are small proteins that mediate inflammation.) The stress response is managed by the hypothalamic-pituitary-adrenal axis (HPAA), which can also influence whole body energy balance. Exercise training may attenuate some of these age-related changes. However, the underlying physiological causes for training-induced alterations remain unclear. A broader understanding of the mechanisms involving aging- and exercise training- related changes of the HPAA, glucose homeostasis and inflammatory processes in horses is necessary as data in this regard is limited.

Some cytokines may promote or inhibit the effects of insulin (a hormone that signals removal of glucose from the blood) and the secretion of other hormones, and are also influenced by age and exercise. The types of cytokines found in different human tissues (abdominal fat, subcutaneous fat and skeletal muscle) vary, but it was unknown if the same was true in horses. This information was important to investigate to help understand how inflammation affects metabolism in the aforementioned tissues.

Twelve Standardbred mares participated in the study. Six mares were old (average of 22.0 yrs) and six were young (average of 7.3 yrs). The first round of testing occurred while the mares were unfit. Testing consisted of standing endocrine stimulation tests, stimulating the pituitary and adrenal portions of the HPAA, as well as a control test. The HPAA was also evaluated during and in recovery from a graded exercise test (similar to a stress test in humans) on the equine treadmill. In addition, mares underwent a glucose tolerance test to evaluate insulin sensitivity and pancreatic function. Mares then trained at a working trot for 30 minutes, three times per week for eight weeks. Consistency of training was checked utilizing a heart rate monitor to ensure exercise intensity did not vary too much. After eight weeks, all endocrine testing was repeated, while mares were concurrently kept in training to avoid losing the effects of long-term exercise. (Note that changes in exercise capacity were measured with a graded exercise test on the equine treadmill before and after training began). In addition, biopsies of skeletal muscle and subcutaneous fat tissue were collected and measured for cytokine content both before and after training.

Finally, a separate pilot study was designed to compare cytokine content of skeletal muscle, subcutaneous fat, abdominal fat and blood in horses at necropsy. Horses were enrolled from the community based on veterinary evaluation and owner decision that euthanasia was the humane course of action. A total of 15 horses contributed to the investigation.

The results of these studies yielded important information. The HPAA reacts differently in response to exercise, recovery from exercise and standing stimulation. Collective evidence suggests

an increase in the sensitivity of both the pituitary and adrenal glands to hormonal signals in response to exercise, particularly in old mares. Although age-related declines in hormone concentrations did appear to be completely restored with cardiovascular exercise training alone, keeping an older horse fit seems very important for maintaining endocrine signals involved in exercise tolerance and recovery, as well as glucose metabolism.

In addition, it has again been shown that moderate exercise training improves insulin sensitivity and glucose tolerance. Novel information discovered here suggests an improvement in pancreatic beta cell function (the cells of the pancreas that produce insulin), especially in aged mares, after training. However, old mares still required higher amounts of insulin to signal removal of glucose from the blood compared to young mares. With the growing number of horses experiencing insulin resistance, this is critical information for the management of such conditions. The influence of inflammatory cytokines cannot be ruled out, as it was also shown that there are differences in blood, muscle and subcutaneous adipose tissue of old and young horses. Overall, exercise appears to be a critical factor to help maintain glucose metabolism during the aging process.

Another major finding was that skeletal muscle, fat tissue from the neck and abdomen and blood, have different cytokine profiles in horses. This novel information is crucial for considering the role of cytokines in metabolism.

In conclusion, it appears that both the pituitary and adrenal glands become less sensitive to stimulation by the appropriate hormones with advancing age. The endocrine regulation of glucose metabolism also changes, and pancreatic beta cells become less efficient over time. Exercise training reverses age-related changes to some degree, but does not completely reverse them. Aged horses experienced an improvement in their ability to perform and recover from exercise, but the improvement did not quite match that of their younger counterparts.

Exercise is a key factor for improving glucose metabolism and is especially important for horses diagnosed with equine metabolic syndrome (also known as insulin resistance) or equine Cushing's syndrome.

Take Home Message

It is important to keep not only older horses, but any horse with metabolic issues, fit and active to the best of the animal's ability. Keep in mind that older horses may not be able to perform at the same peak level as they did in younger years, but exercise should nonetheless be incorporated into the older animal's life as soundness allows. The phrase, "Use it or lose it!" certainly seems applicable when considering management practices of the older horse, while keeping in mind the abilities of the individual animal may change over time.



Can a Bacterial Infection of the Hoof Laminae Contribute to the Incidence of Laminitis?

The objective of this study begun in 2008 at the Center under the leadership of Janet Onishi, from the Department of Biochemistry and Microbiology, was to study and evaluate the possibility that a bacterial infection of the laminae contributes to the disease of laminitis.

Chronic laminitis is a condition in which horses experience repeated episodes of acute laminitis. Animals with the condition often have abnormal hooves which display diverging growth rings, expanded white lines, overgrown heels and flat soles. The cause is unknown. The Onishi lab completed a study to evaluate the possibility that a bacterial infection of the laminae contributes to the disease. This study involved developing methods to collect laminae tissue using aseptic techniques. Bacteria in the laminae were enumerated from control, non-laminitic horses and from horses with chronic laminitis. The results of the study showed that laminae collected from the majority of control horses had no bacteria or very low numbers. In contrast, bacteria were present in the laminae collected from all of the chronically laminitic horses. The increase was statistically significant and importantly, although the bacteria identified were commonly found in the environment, they were potentially pathogenic. This study is the first to implicate a role for bacteria in chronic laminitis and to also explain why antibiotic treatments have failed to improve the life of horses suffering with chronic laminitis. Many of the bacteria recovered from the tissue are known to be capable of forming biofilm infections. Biofilm infections are well known to be resistant to antibiotic treatments.

A second study was completed to investigate the possibility that a laminar bacterial infection might contribute toward the development of acute laminitis. This study involved collecting laminae from horses displaying early symptoms of lameness following infusion with carbohydrates. The results of the study showed that when Obel grade 2 lameness had developed, no evidence of a bacterial infection in the laminae was detected. It is concluded that a bacterial infection of the laminae does not contribute to a horse's first episode of acute laminitis.

With continued research, it might be possible to determine whether bacterial growth in the laminae of certain horses increases during the recovery phase after an initial acute laminitic episode. It is perhaps these horses that progress to the chronic phase. Support from the equine community to use horses in a research study would be required to continue this line of research.

Take Home Message

This study is the first to implicate a role for bacteria in chronic laminitis and to also explain why antibiotic treatments have failed to improve the life of horses suffering with chronic laminitis. With continued research, it might be possible to determine whether bacterial growth in the laminae of certain horses increases during the recovery phase after an initial acute laminitic episode.

Metabonomics

Sarah Ralston and her colleagues Lucia Pappalardo and Istvan Pelczer have continued their exciting work in the area of metabonomics. Summarized below is an overview of her work emphasizing the role that metabonomic analysis plays in the detection of metabolic markers of disease and the differences in metabolic marker profiles due to age and breed.

NMR-based Metabonomic Analyses of horse serum: Detection of metabolic markers of disease

Nuclear magnetic resonance (NMR) spectroscopy-based metabonomics is a multivariate approach to characterize the unique metabolic profiles of living creatures by evaluation of all metabolites measured simultaneously in biomaterials such as blood or other biofluids. The spectra of biological fluids and tissues generated by NMR spectroscopy reflects the full range of metabolites present in a sample by detection of the unique nuclear resonance pattern of a given molecule. A given substance is then represented by one or more peaks that appear at specific locations along the chemical shift scale and the peaks' fine structures (singlet, doublet, triplet, etc.) reflect the unique interactions of protons in the chemical structure. Multivariate statistical analysis of the peaks can then identify metabolite components which vary systematically across a sample set in a significant manner and provide metabolic profiles (metabonomes) associated with specific disease states, permitting identification of diagnostic metabolic markers and providing better understanding of the underlying disease processes. Previous metabonomic studies of horses revealed complex but distinct metabolic profiles associated with metabolic disorders such as insulin resistance and Osteochondrosis.

Osteochondrosis dessicans (OCD) is a growth-related defect caused by abnormal calcification of cartilage matrices at the growth plates that result in articular cartilage defects. Radiographically apparent lesions appear most commonly in young, rapidly growing horses between three to 12 months of age, though clinical signs of joint effusion and lameness may not surface until the animals are put into training. Though defects can be induced by improper nutrition and other environmental factors, it has been well documented that tibiotarsal lesions are heritable in horses and tend to be especially prevalent in Standardbreds. A correlation between abnormal glucose/insulin metabolism and the presence of lesions has been reported in yearling Standardbreds but the metabolic defects associated with OCD have not been well defined, though altered gene expression in the chondrocytes in the affected cartilage has been incriminated. Cartilage defects can be corrected surgically however their presence represents a significant economic disadvantage costing over \$2000 for surgical correction. Therefore it would be very beneficial if horses predisposed to OCD could be identified before lesions develop and, if the metabolic defect was identified, dietary interventions could be implemented to reduce or prevent the disease.

Ralston's group hypothesized that NMR-based metabonomic analyses would reveal distinct metabonomes associated with hock OCD lesions in young Standardbred horses and that the metabonomes of two to three month old Standardbred foals would be predictive of future development of lesions. To test the hypotheses, three experiments were conducted with the following objectives: 1) determine if yearling Standardbred horses with and without OCD would be metabolically distinct based on NMR-based metabonomic analyses of serum, 2) verify that differences observed in the first study were repeatable and measure plasma glucose and insulin concentrations associated with the metabonomes of each horse, and 3) determine if NMR-based metabonomic analyses of serum from nursing Standardbred foals would be predictive of future appearance of OCD hock lesions.

Conclusions were that NMR-based metabonomic analyses are a sensitive method to identify differences between distinct groups of individuals. The statistical analyses, however, are also influenced by a variety of factors such as sample collection techniques and spurious correlations

caused by non-relevant variations that need to be identified to maximize the utility of the resultant models. Young Standardbred horses that develop hock OCD differ metabolically from those that do not develop the disease despite similar management and genetic backgrounds. The metabolic differences also may be detected by NMR-based metabonomic analyses before the lesions appear in nursing foals. More analyses, however, will be necessary to determine the exact OCD metabonome that would be useful in both diagnosis and prevention of the disease.

Take Home Message

Young Standardbred horses that develop hock OCD differ metabolically from those that do not develop the disease despite similar management and genetic backgrounds and that metabolic differences also may be detected by NMR-based metabonomic analyses before the lesions appear in nursing foals.

Breed and age effects on metabolic profiles of young horses using Nuclear Magnetic Resonance (NMR)-based Metabonomic analyses of serum

It is well accepted that nutritional needs differ between ages and breeds of horses, though the metabolic basis for these variances have not yet been identified in detail. For example young, growing horses have higher protein needs than do older animals and these needs can vary between types of horses, however the amino acid profiles and other potential nutrient differences have not been identified. The ability to identify specific and complex differences in metabolism between various ages and breeds may also be useful to determine precise nutritional needs.

The objective of this work was to test the hypothesis that NMR-based metabonomic analyses of serum would reveal significant age and breed metabolic differences in young horses. In this study, metabolic profiles of two year old mustangs were compared to those one year of age and two year old draft cross horses.

There were distinct metabolic clusters between the three groups of horses based on both breed and age, with all three groups being notably different. Serum urea peaks were one of the most significant components between the three groups, with higher peak averages in both groups of two year olds when compared to yearlings. This probably reflects the higher protein needs of yearlings which utilized more of the protein amino acids in the ration than the older animals that were growing at a slower rate. However, when the urea peak was suppressed, there was a tighter cluster separation between the two year olds, with certain amino acids, lipoproteins and glucose differing between the mustangs and draft crosses. It is of interest that all four mustangs were from Nevada herds which are recognized for their high light horse influence as opposed to other BLM Horse Management Areas where draft or Spanish barb influence predominates. There were also significant differences in amino acid, lipoprotein and glucose due to age.

Take Home Message

NMR-based metabonomic analyses are useful in detecting metabolic differences between different ages and types of horses regarding protein, amino acid and glucose metabolism.

Academic Assessment of Equine Welfare during the Gather Process of the Bureau of Land Management's Wild Horse and Burro Program

Sarah Ralston has for the past two years been involved in the welfare of the wild horses and burros on Bureau of Land Management (BLM) land throughout the United States. She and colleagues have been asked by BLM to assess equine welfare during gatherings, a process which always comes under public scrutiny. The American Horse Protection Association (AHPA) has a mission to protect and preserve America's wild horses and burros on US public range lands. The Bureau of Land Management has a priority to ensure that America's public lands are healthy and productive so that all species dependent on them can thrive. This includes a mandate to maintain wild life populations, including wild horses and burros, to sustainable levels. The means by which the BLM had traditionally managed equid populations was by conducting periodic "gathers" to remove excess animals and maintain genetic diversity. The excess animals were then put up for sale or adoption according to strict criteria established by the BLM. The BLM operatives also ensure, to the best of their ability, the welfare of wild horses and burros during the gather, holding and transportation processes. Currently, there are over 33,000 free roaming wild horses and burros on nearly 200 Herd Management Areas (HMAs) in 10 western states. Since 2001, however, the number of animals removed (approximately 74,000) has far exceeded the number (approximately 46,000 or 62%) that were adopted or sold.

In 2010, the AHPA in cooperation with the BLM, established an Independent Designated Observer Pilot Program (IDOPP). Four observers were selected for this task as academia-based equine specialists with experience in horse behavior and welfare. The IDOPP was charged with examining the care and handling of the animals during BLM-conducted gathers to determine if the procedures were conducted in a humane fashion and if improvements could/should be made. They were not charged with determining the philosophy of whether or not gathers should be conducted.

An objective checklist was developed for the observations and resultant recommendations. Three HMAs were selected for the two teams of two observers based on location and a schedule that included multiple, successive days of gathering at one site. Upon arrival, IO interviewed BLM employees and associated contractors, such as the APHIS veterinarian, wranglers, and the helicopter pilots. IO observed the entire gather process, including the use of the helicopter to move the horses to the capture pen and the care and handling of the horses, from sorting and identification through loading into trailers and transport to the BLM's short-term holding facilities. The checklists were completed each day, including additional comments and recommendations, summarized for each HMA site and were submitted as a report to the AHPA. The individual IO reports were compiled by the AHPA and released to the public via posting on the BLM's web site.

The IO's observed the gathering of a total of 352 horses at Owyhee, NV, Stinking Waters, OR and Twin Peaks, CA on a total of 11 observation days. Although it was evident that there was a range of expertise among handlers, the primary crews were knowledgeable, used acceptable methods for moving horses forward, and were skilled in avoiding excessive stress in the captured animals. When faced with unexpected and extraordinary circumstances (e.g., water toxemia at the Owyhee gather) BLM, APHIS, and the contractor demonstrated the ability to review, assess and adapt procedures to ensure the health and well being of the animals. Specific IO recommendations focused on improvements in the safety of the facility design, handling of the horses, including roping criteria, sorting techniques, and transport practices, as well as the impact of the public observers during the gather activities.

Take Home Message

The IO program provided a credible welfare assessment of the handling and care of wild horses during BLM gather activities on HMAs, in part due to the IOs' academic background, knowledge of the issues, and lack of formal affiliation with the BLM. The practical attributes of their recommendations to the mission and goals of the BLM program, and the utilization of an objective checklist by the IO resulted in the creation of non-biased, animal welfare recommendations that could be implemented by the BLM and contractors.

Responsible Horse Ownership

In 2009, the Center identified the need to address the concern and consequences of the growing unwanted horse population. Answers to horse ownership questions such as; what to do when one can no longer adequately care for a horse or, what to do if one is looking to purchase a horse, are available on the new Responsible Horse Ownership page of the Equine Science Center website, an initiative led by Sarah Ralston.

The Center is making a concerted effort to educate current and potential horse owners about the many responsibilities that are part and parcel of owning a horse. It is imperative that prospective owners are well aware of the long-term commitment and needs of horses in their care. The dedicated webpage includes downloadable PDF handouts and web PowerPoint presentations entitled "Responsible Horse Ownership" and "The Economics of Horse Ownership." Visitors to the Responsible Horse Ownership webpage will also find a series of Fact Sheets related to owning a horse. The Responsible Horse Ownership webpage also contains information from the American Horse Council's Unwanted Horse Coalition.

Farm and Land Mangement and Environmental Stewardship

Ryders Lane Environmental Best Management Practice Demonstration Horse Farm

Rutgers researchers from several departments have been hard at work improving the Ryders Lane demonstration horse farm on the George H. Cook Campus. Over the past few years, some dramatic changes have been implemented to make the farm more environmentally friendly. The project was funded by the Environmental Protection Agency, New Jersey Department of Agriculture, Natural Resources Conservation Service, and Northeast Sustainable Agriculture Research & Education. The project is headed by Carey Williams, Extension Specialist in Equine Management with the help of Michael Westendorf, specializing in manure management and Christopher Obropta, specializing in water quality, along with many other County Agricultural and Natural Resource Management Agents.



Several best management practices have been implemented to address water quality concerns. Researchers constructed a bioswale, which filters excess nutrients out of runoff water before it is discharged into local waterways, and a rain garden, which also cleans dirty water running off of a paddock. Drain wells were installed around the barn. The drain wells capture clean rainwater from the barn roof gutter system and either permits water infiltration or discharge, rather than allowing the water to flow throughout the paddock while picking up pollutants. Changes in grading also keep paddocks dry and prevent water ponding. Current research includes water sampling during rain events at the bioswale. The swale is equipped with a monitoring device to document how effective the project has been at improving the water quality of the runoff. Two automatic samplers have been installed by the inlet and outlet of the bioswale to monitor water elevation. Researchers calculate the amount of water that travels through the inlet. The automatic samplers are programmed to collect water every thirty minutes during a rain storm. Samples from the inlet and outlet are analyzed for nutrients and bacteria. Results from the nutrient and bacteria tests are compared (inlet versus outlet) to determine improved water quality as the runoff travels through the bioswale. The flow calculations at the inlet and outlet are used to measure any infiltration that occurs in the bioswale.



The Ryders Lane farm has also been used for composting studies. A recent project compared four horse bedding types: straw, a pelleted wheat straw product, a pelleted wood product, and wood shavings. Twelve Standardbred horses were stalled on the four bedding types (three horses per bedding type) for 16 hours per day over a three week period of time. All bedding was collected daily and evaluated for: 1) amount of bedding used in the stalls, 2) absorption, 3) air quality, and 4) composting characteristics. The project found that all four types were acceptable bedding sources. The least amount of bedding used was with the pelleted straw product. Air quality had the largest amount of particulate matter (dust) with the pelleted wood product. All four bedding sources composted properly when mixed with stall waste. The pelleted wheat straw product composted very well and resulted in the greatest volume reduction of all of the bedding sources.

Researchers addressed pasture health and management concerns by demonstrating a rotational grazing system. The addition of “stress lots” allows the horses to stay outside while the pastures recover from grazing or when weather conditions do not allow grazing. When horses have grazed down one pasture, they are rotated to another one which has already recovered. Manure storage was another issue on the farm; researchers worked with Natural Resources Conservation Service to design a larger, better storage facility and also created a composting area to process the raw manure into a more useful product. Lastly, a Comprehensive Nutrient Management Plan was written for the farm to ensure that nutrients were being utilized efficiently for crop and animal growth/maintenance while minimizing excesses.

While these projects were a huge undertaking, the team is not finished. Future plans will make the farm even more productive and educational. Work has begun on renovating a four-acre plot for a future rotational grazing project, which will examine grazing pressure and preference and compare forage species. The rain garden will be redesigned and rebuilt. A garden composed of grasses instead of shrubs will be lower maintenance and will remove more nitrogen from stormwater.

Plans are in place to improve the compost area with the addition of running water; finished compost will be marketed as a consumer product. Work has also begun on an audio application tour of the facility that visitors can experience on any compatible handheld device, as well as educational tri-fold brochures at each stop on the tour that visitors can take home.

Take Home Message

The demonstration horse farm at Ryders Lane will continually evolve as a best management practices example of “what to do” to minimize negative environmental impacts for equine operations around the state and region.

Pasture Walks

This past June, the Rutgers Equine Science Center was involved with two Pasture Walk meetings in New Jersey. A Pasture Walk is a workshop in which a pasture expert or group of experts leads a group of participants through a pasture to discuss different management practices and identify vegetation.

The first Pasture Walk took place on June 23 at Dorsett Farms in Woolwich Township, Gloucester County. It was funded by Natural Resources Conservation Service and hosted by Ann Dorsett. Mrs. Dorsett was an excellent host, providing all participants with Jersey Fresh produce to snack on! The meeting was led by Carey Williams, Extension Specialist in Equine Management, with help from Michael Westendorf, Extension Specialist in Livestock Management and Robert Mickel, Hunterdon County Agricultural Agent. The group moved through her fields and discussed topics such as stocking density, overgrazing, metabolic problems in horses, weed and forage identification, sandy soils, manure management, and more. Although the afternoon was hot, all who attended reported having a wonderful time and learned a lot.

The second Pasture Walk took place on June 29 at Mortonhouse Farm in Long Branch, Morris County. The host, John Crater, kept everyone entertained before the meeting began. He had his matching Belgian draft horse pair hooked up to a large covered wagon! The Center’s very own Karyn Malinowski had a blast driving the team and some participants around the farm. The meeting was led by the same Rutgers team, with the addition of Stephen Komar, Sussex County Agricultural Agent. Topics discussed at this farm included understocking and obesity, proper mowing practices, weed and forage identification, the importance of soil testing, and more. After the conclusion of the meeting, Mr. Crater again hitched his Belgian pair to an antique hay tedder and demonstrated its use for interested participants. It was quite an evening!

A last pasture-related meeting was held in September at the Best Management Practice (BMP) Demonstration Horse Farm at Ryders Lane on the G.H. Cook Campus, New Brunswick. Despite the Route 1 construction and rush hour traffic, 20 people made it to the farm. Carey Williams again led the meeting with help from Mike Westendorf, Chris Obropta, Karyn Malinowski, Farm Manager Clint Burgher, and County Agents Stephen Komar and Robert Mickel. The farm’s new brochure sets were unveiled so that visitors can take home what they learned for future reference. The group



stopped at each BMP poster to discuss manure and compost management, water quality management, pasture management, and anything else that came up. Most participants found the information very valuable and reported a significant increase in knowledge after the meeting. One participant commented that it was “very thought-provoking.”

Animal Waste Research

The Animal Waste Research Outline is the work of new Center member, Cristiane San Miguel, who this past year researched the impact of horse manure on the development of antibiotic resistance in soil. The work was funded by a Center grant from the NJDA. Manure management is an important aspect of best management practices in the equine industry. Land application is a sustainable and cost effective option. However, as the organic industry booms, manure is increasingly used as a soil amendment, impacting a variety of soil properties, including ones associated with enhanced gene transfer in the soil environment. Current veterinary practice includes the routine administration of a variety of pharmaceuticals, depending on the animal species. Many livestock are given prophylactic antibiotics. Similarly, anthelmintics, such as Ivermectin, are routinely administered to horses as a preventive measure. Ivermectin, which is derived from a soil bacterium as is a variety of antibiotic compounds including streptomycin, chloramphenicol, tetracycline and vancomycin, is cleared from the body mainly in feces. As a result, this drug is introduced to the soil environment when horse manure is land-applied. Thus, the presence of ivermectin could act as selective pressure on the microbial community, which is largely responsible for nutrient cycling in the soil. To test this, soil collected that had either received fresh or composted horse manure or no manure at all (control soil), was spiked with Ivermectin and incubated. Soil was sampled over the course of two weeks and microbes from the soil were grown on agar. Additionally, DNA was extracted from liquid cultures, separated via denaturing gradient gel electrophoresis (DGGE), and sequenced.

Preliminary results show that the addition of composted manure significantly increased the numbers of bacteria present in the soil while counts from soil receiving fresh manure and the control soil did not differ. Additionally, the introduction of Ivermectin significantly decreased bacterial counts when compared to soil that did not receive the anthelmintic. Despite the differences in overall number of bacteria present in each soil treatment, DGGE analysis did not reveal differences in the composition of the bacterial communities associated with each soil treatment. Sequencing of selected bands showed a predominance of species within the phyla, *Proteobacteria* and *Bacteroidetes*. Thus, manure amendment did not contribute novel bacteria to the soil bacterial community, regardless of whether the manure was composted or fresh. At the same time, composting of the manure significantly increased the size of the bacterial community and is, therefore, a beneficial practice.

Take Home Message

The introduction of Ivermectin significantly decreased bacterial counts when compared to soil that did not receive the anthelmintic. Manure amendment did not contribute novel bacteria to the soil bacterial community, regardless of whether the manure was composted or fresh. Composting of the manure significantly increased the size of the bacterial community and is, therefore, a beneficial practice.

Equine Pasture and Environmental Economics

Described below is the work of Bill Sciarrappa, Monmouth County Agricultural Resources Management Agent, and colleagues. The Equine Science Center has invested research dollars repeatedly in the area of equine pasture management, especially in area of watersheds because of the potential impact on the environment. The net effect of a well managed equine pasture is very positive for pasturage value, equine health and the benefit of open space. Less well known are improvements in natural resource wealth through water conservation. One pilot study, sponsored by the Center, focused on assessing the value of water filtration and retention in agricultural lands of the Colts Neck Watershed. Most of the ag-lands in this horseshoe shaped 34,671 acre region are equine operations. There is a high ratio of equine to human residents in the region. These agro-ecosystems provide an economic bonanza for current and future generations through water recycling, purification and storage.

The Department of Environmental Protection has termed this economic resource savings as Natural Capital - an investment in goods and eco- services that pays dividends in perpetuity by reducing storm water run-off problems such as flooding, water pollution, soil erosion, and the cost of potable water. The Colts Neck Watershed made an ideal study region for this concept comparison because a large dam divides the rural horse farms of the western portion from the suburban development of the coastal portion. The coastal waterways of the Navesink River are plagued with excessive concentrations of nitrogen, phosphorus and bacteria that close beaches to swimmers, close clam beds to harvest, reduce fish populations and cause human health problems. The rural waterway of the west were measured to have very few of these environmental problems and of the three critical water quality parameters, there were no exceedences for nitrate, dissolved oxygen or stream turbidity. This finding indicates that organic manures and synthetic fertilizers are not being applied at an excessive rate and that the agricultural watershed had several major unforeseen economic benefits.

Total volume of water recharged into the Watershed is approximately 7.8 billion gallons annually and has real value both as goods extracted and eco-services provided. Groundwater recharge rates for commercial development and building lots of a half acre or less recharge only from two to seven inches of groundwater per year compared to equine pasture values up to 15 inches or more per year. Average rainfall amounts are approximately 45 inches annually. A conservative housing development rate of 756 acres per year in this environmentally critical region would decrease the volume of water recharged in the watershed by 13% every five years or approximately a quantity of 1 billion gallons leading to an expected increase in higher prices for drinking water as well as an eco-service loss through catastrophic storm-water flooding and increased pollution.

Findings from this work show that the total annual value of the natural resources in this moderate sized watershed are approximately \$44 million dollars for goods and a \$136 million dollars for eco-services out of a total watershed value of \$180 million dollars. The financial contribution from agricultural and forest sectors is approximately \$57 million dollars and from wetlands/open waters approximately \$120 million dollars, leaving urban values at just over \$3 million dollars annually. Combined value of the goods and services may be closely correlated to quality and sustainability of life. Averaging the human population with this recharge total shows an annual need of 6.5 billion gallons per year compared to the 7.8 billion gallons of water that become recycled each year. This calculation of total recharge exceeds the 2000 gallon per person minimum by 8.3% - a nice cushion toward continued prosperity if this delicate balance is maintained.

Currently, one-third of our Garden State is urbanized, one-third is “green” and the remaining third is “up for grabs.” A question to ask is - Do we preserve our natural resources in perpetuity or do we cater to the building industry demands driven by short-term economic incentives which lead NJ to increased housing density, urban sprawl, and greater human populations? The true value of eco-services must be determined and factored in for informed and foresighted policy decision making. With the related argument against low farm taxation, the high value of farmland eco-services is another strong point to go along with the annual high service costs of the developed land vs. the low service costs of farmland, fields and forests. For example, every dollar in property taxes in nearby Freehold Township; developed urban zones cost \$1.51 for services vs. \$0.33 for farms, fields, forests and open space. Farmers humorously say that horses do not go to school and foresters say trees don’t need water pipes or first aid. From these study results we see why their common horse-sense is right on target.

Take Home Message

Agricultural and forest lands are a good value for communities. They help keep New Jersey green and reflect low community service costs compared to that of developed land.

Regional Project: NE-1041: Horses and the Environment

Michael Westendorf, Carey Williams, Karyn Malinowski, Stephen Komar, and Laura Gladney are members of the NE-1041 Regional Project which coordinates environmental research as it pertains to horse farms across the Northeast. The ultimate goal of the project is to use the best existing data to minimize negative environmental impacts of equine operations. In addition to NJ, the project includes participants from VT, CT, MA, PA, MD, NC, MN, SD, KY, and LA.

The group continues to meet annually to discuss research and extension projects being conducted across the region. Research topics include Protection of Environmental Resources through Implementation of Feed Management, Best Management Practices on Equine Farms, Rotational Grazing Trials, Forage Variety Trials, a Round Bale Feeder Trial, and Dietary Protein Affects Nitrogen and Ammonia Excretion in Horses. Extension programs included Pasture Walks and Workshops, free or fee-based Pasture Management Programs, Renovating Model Horse Farms, and the production of educational materials.

Future research priorities include a regional Best Management Practices (BMP) survey, a national NRCS grant looking at BMPs on small livestock farms; demonstration farms to showcase BMPs (similar to Rutgers’ BMP Demonstration Horse Farm), pasture renovation and rotational grazing projects, a water-extractable phosphorus project, manure disposal/composting and use as energy, and horse farm certification programs. The production of quality literature reviews in relevant topics is ongoing.

Ensuring a Sustainable Future for the Equine Industry

Equine Science 4 Kids!

There are approximately 10,000 members of the United States Pony Clubs and 1.6 million animal project members involved in 4-H. While a plethora of horse information websites for young people exists; the majority focus on breeds of horses, their care and management, riding disciplines and the allure that “everything horses” has especially for young females. There is much less information available to young people about the physiology of horses and the research-based information available about equine care and management at an academic level appropriate for enthusiasts of junior high school age. This age range also coincides with the age group where a decrease in membership in 4-H programs, for example, is seen.

To address the need for scientific, research-based information about horses and their care and management at a level appropriate for junior high school youth, the Rutgers Equine Science Center (ESC) developed “*Equine Science 4 Kids!*” (ES4K), an interactive youth component on the Center’s website; esc.rutgers.edu/kids. The goal was to create a dynamic and interactive online classroom featuring an equine mascot to teach youth (ages 10-14 years) about the science of horses. Specific objectives were to: 1) teach youth about equine science based on research conducted at the Equine Science Center; 2) increase traffic to the overall Center website; and 3) attract alumni and their friends and family through the use of a horse with a Rutgers history as the figurehead guiding youth through the educational component.

“*Equine Science 4 Kids*”, launched on April 5, 2010, received over 7,000 hits in the first 30 days. Eighty-seven percent of viewers reported an increase in knowledge of equine science, 87% would recommend the site to a friend, and positive feedback included the indication of the desire “to be enrolled at Rutgers now”, “this was awesome,” and that “the sounds were cool.” The top ten downloads for the ESC website for 2010 were all related to ES4K. Favorite pages included items on the classroom countertop and their accompanying sounds and the interactive game. ESC web traffic increased 10% in 2010; 3.1 million hits in 2010 versus 2.8 million in 2009; 20,545 were attributed to ES4K. Unique visitors increased 17.5% and average visit length increased 138% from 36 to 86 seconds.



In partnership with the New Jersey Department of Agriculture, the Center launched “Fun on the Farm” an interactive educational game to teach children about the science of horse farm management and environmental stewardship. The game is accessible from the classroom page on Equine Science 4 Kids.

Take Home Message

“*Equine Science 4 Kids*” has been successful in accomplishing its goal of driving visitors to the Equine Science Center website and in teaching equine science to youth. The youth component of the Center’s website has also resulted in an increase in general traffic to the more advanced portions of the website, including the virtual tours of the Ryders Lane Farm and the Equine Exercise Physiology Lab, as well as the podcasts and fact sheets available for download.

Horse Racing Industry

The Equine Science Center continues to serve as an advisor to the racing industry and an advocate for unity and cooperation among the various equine breed groups and disciplines. The urgency for a “unified voice” became critical in 2006, as the issue of the sustainability of the racing industry came into sharp focus among legislators, horsemen, breeders, the agricultural industry, the gaming industry, and academia. In 2010-11 Center director, Karyn Malinowski provided science-based information regarding the importance of horse racing to the state and responded to the controversial “Hanson” report. The Center’s role in bringing the various forces together has been recognized for its outstanding value and effectiveness. Kenneth McKeever continues to serve as an advisor for the Center on integrity issues as related to performance enhancing substance use in the horse industry.

Take Home Message

The Equine Science Center continues to serve as an advisor to the racing industry and an advocate for unity and cooperation among the various equine breed groups and disciplines.

Academics



Students interested in pursuing careers in the horse industry or just improving their knowledge of horses can study equine science in the Department of Animal Sciences.

<http://animalsciences.rutgers.edu/>.

Under the auspices of the Animal Industries-Equine Specialization major, students take all of the equine didactic courses available in addition to courses in marketing, basic sciences and animal science, and also sign up for “hands-on” credits

through the Equine Practicum, Research in Animal Science course and/or Cooperative Education. A minor in Equine Science is also available to students majoring in other disciplines.

Courses tend to emphasize the science of horses—not only “how” as in many other equine curricula, but “why.” Students interact closely with their advisors and are given guidance in career decisions.

Young Horse Teaching and Research Program (YHTRP)

For the first ten years, Sarah Ralston’s YHTRP focused on the unique nutritional and behavioral needs of draft cross weanlings and yearlings from ranches collecting pregnant mare urine in North Dakota and Canada. Students in the YHTRP worked with foals registered by the North American Equine Ranching Information Council (NAERIC) to better understand this increasingly popular type of horse on which there was little scientific information. Draft cross horses are now well-recognized as valuable equine animals, commanding high prices even as weanlings, and a great deal has been learned about their nutritional needs and behavior. Because NAERIC horses now have

well-established markets in a variety of disciplines, they are no longer "at risk" for finding good homes and athletic careers.

However, thousands of Bureau of Land Management (BLM) mustangs are removed from public ranges annually to prevent overgrazing. While obviously not the same as the larger, heavier draft-crosses, they too can be wonderful equine athletes, excelling in a wide variety of disciplines. Unfortunately, the general public's perception is that mustangs are "wild," difficult to handle and not very useful. An objective of the YHTRP is to help change that perception.

On September 11, 2010, eight mustangs were acquired from the Sussex County Fairgrounds BLM Wild Horse Adoption for the Rutgers program. Six of the horses were not in the regular adoption program because they had already been to three adoption events without success, and as such were direct "sales" ("three strikes") horses.

As in previous years, students in the YHTRP worked diligently throughout the fall and spring semesters to prepare their young mustangs for the annual horse show which was held on April 30. During the classes, student handlers guided their mustangs through basic tasks such as leading at a walk and trot, turning on the forehand and the haunches, and standing "square". Several of the horses that had more advanced training pleased the crowd by demonstrating ground driving skills and even bowing on command. The show served as an excellent opportunity for potential buyers to see the mustangs in action prior to the auction, which was held the following day.



A crowd of roughly 100 people, comprised of parents, students, admirers, and alumni, arrived to view (and to bid) on the mustangs. After a preview of the mustangs in a clinic with trainer Jose Romero Bosch, as well as a special showing of RU ShyAnne and her foal SkyLark, the auction commenced. Four individuals had registered to bid and each party expressed interest in a different horse, therefore an official auction was not required. Nevertheless, Ralston was pleased with the outcome of the event, "The goal this year was to promote the mustangs, which I think we have done quite successfully. Hundreds of people now recognize that mustangs can be groomed and trained like any other horse to be gorgeous, athletic candidates for just about any equine discipline that accepts all breeds as competitors."

Public Course Offerings

Many of the SEBS undergraduate courses are open to the general public through the Office of Continuing Professional Education. Courses include: Developing Future Leaders for the Equine Industry; Horse Management; Equine Nutrition; and Advanced Equine Health and Management.

Developing Future Leaders for the Equine Industry is a two-day short course directed



toward those involved in New Jersey's equine industry. Developed and offered by the Equine Science Center, the course brings together a team of instructors led by Mary Nikola and Karyn Malinowski. Topics include the value of the equine industry, networking and relationship-building, decision-making strategies, leadership practices and behaviors, building coalitions, and industry management. In 2010, seventy-five percent of the students in a pre-and post-class survey stated that the class exceeded expectations. All students expressed the desire to expand the class to more days and indicated an increase in skill set for building legislative relationships and in coalition building by 202 and 344 percent, respectively.

Horse Management, taught by Sarah Ralston, is a 14 week course providing an introduction to the anatomy, physiology, nutrition and behavior of a horse. Animal science equine management techniques and the practical aspects of horse care including stabling, shoeing/hoof care, common diseases and emergency care are discussed in classroom lectures. Students benefit from live demonstrations and hands-on training. In addition to the classroom lectures and demonstrations, optional field trips are offered throughout the program schedule.

Ralston also offers **Equine Nutrition**, providing in-depth information on the function and peculiarities of equine gastrointestinal physiology and the importance and metabolism of the nutrients essential for equine well being. Common feeds and supplements used to provide these nutrients are discussed in addition to how to read and interpret commercial feed labels and balance rations, using feed analyses and computer programs. Students learn how to recognize and prevent feed-related illnesses and how to meet the special needs of horses that are ill or geriatric. Practical approaches to feeding various classes of horses, such as broodmares, stallions, foals and performance horses, in addition to feeding systems including pasture management, are presented in the last segments of the course. Several optional "wet labs" and field trips are offered during the semester.

Advanced Equine Health Care and Management is taught by Michael M. Fugaro, a veterinarian and associate professor of equine studies at Centenary College and an adjunct professor at Rutgers University. This course presents in-depth information on the diseases and common emergency disorders of horses. It utilizes basic concepts of anatomy and physiology, applies them to clinical situations that arise in horses, and teaches students how to effectively manage health-related situations. A limited number of seats in the program are available to continuing education (non-matriculated) students.

Techniques in Equine Exercise Physiology, taught by Kenneth McKeever, provides students with a hands-on opportunity to become proficient in many of the techniques and equipment used when conducting equine exercise physiology research.

Recent Graduates

Under the leadership of Kenneth McKeever, professor of animal science at the Rutgers School of Environmental and Biological Sciences, Nettie Liburt-Weiner and Jim Baldassari graduated in January 2011 with a Ph.D. and Master's degree, respectively.

Doris C. Murphy Endowed Scholarship in Equine Science

The Doris C. Murphy Endowed Scholarship in Equine Science was created to honor the memory of a woman who loved animals. Shortly before Ms. Murphy's death in 1998, she contacted her financial advisor, Kate Sweeney of Smith Barney, and expressed her desire to support animal studies. Ms. Sweeney, a Cook College alumna, suggested the equine science program as an appropriate beneficiary, and as Ms. Murphy was also very supportive of women's education, the endowed scholarship is offered to female undergraduate students majoring in Animal Sciences with an equine science interest. Students must also be New Jersey residents. Scholarship recipients for the 2011-2012 academic year were Alex Broomell, Rebecca Freiday, Melissa Koger, Rachel Walter and Samantha Washington.

Community/Industry Involvement

Former Rutgers Football Mascot Horse Makes a Rare Public Appearance



Lord Nelson, the celebrated horse formerly ridden by Rutgers University football mascot the Scarlet Knight, made a public appearance at the New Jersey State 4H Championship Horse Show on Friday, August 27, 2010 at the Horse Park of New Jersey. Lord Nelson has always been up for an adventure; from football games to patrolling the streets of New Brunswick in his younger days, but it wasn't until a warm Friday afternoon in August that Nelson stepped hoof off the property where he has been kept since his retirement in 2001.

Commencing the weekend's festivities were performances by various 4H drill teams followed by a ceremonial parade led by none other than Lord Nelson himself! After proudly marching around the arena, Nelson took full advantage of his celebrity status by meeting with fans at the ice cream social held in the pavilion where he was treated to his own bowl of vanilla ice cream and a slice of chocolate cake. To get the full "scoop" and see pictures from the event, check out Lord Nelson's blog at <http://lordnelsonsblog.blogspot.com/>

Record Turn-Out for Annual Equine Science Update

The annual Equine Science Update was held on Tuesday, December 14 at the Cook Campus Center on the G.H. Cook Campus in New Brunswick. The Equine Science Update provides an opportunity for the Center to share the status and progress of its current and ongoing research projects and initiatives with the greater equine community. The evening began with a lively and entertaining presentation of *Equine Science 4 Kids* by Middlesex County 4-H member Rachel

VanDemark and undergraduate student Kelly VanDemark. Center Director Karyn Malinowski provided a review of Center activity throughout the course of the last fiscal year. She also previewed new initiatives and upcoming projects as they relate to the celebration of the Center's 10th anniversary.

The highlight of the evening was a \$100,000.00 donation from Malinowski to the Equine Science Center. Chairwoman of the Rutgers University Board for Equine Advancement, Sandy Denarski, Associate Director of development for the School of Environmental and Biological Sciences, Kelly Watts, and Executive Dean of Agriculture and Natural Resources, Robert M. Goodman, were present to graciously accept the donation on behalf of the Rutgers University Foundation. Malinowski's gift will be applied to continued scientific equine research and support of Equine Science Center programs.



The keynote lecture for the Equine Science Update, "Helmets, boots, and cranberries: an overview of nutraceuticals for horses" was given by Kenneth McKeever; additional presentations were given by Sarah Ralston, Carey Williams, Michael Westendorf, and Janet Onishi. Graduate student Nettie Liburt also presented an update of her research. The event was a tremendous success as almost 200 guests braved the bitter cold for an engaging evening of equine science, learning, community outreach, and celebration.

Ag Field Day at Rutgers Day

The Center celebrated 10 years of "Better Horse Care through Research and Education" with a party at the Red Barn during Ag Field Day on April 30th. The party featured two demonstrations of a horse running on the treadmill in the equine exercise physiology laboratory. For each demonstration, over 130 guests packed the lab in order to get a glimpse of a horse running near top-speed on the treadmill. In addition to learning about the sound equine science conducted at the Center, visitors of the Red Barn thoroughly enjoyed an opportunity to get temporary tattoos and stickers, enter a drawing for an Equine Science Center and Rick's Saddle Shop gift bag, and grab a mini-cupcake!

Young Horse Auction

The Young Horse Teaching and Research Program's Annual Auction on May 1st was a "Wild" success. The mustangs all looked fabulous and were the best behaved group of young horses in the twelve years of the program's existence. The goal this year was to promote mustangs. Hundreds of people now recognize that the gathered mustangs, even the sales horses, can be groomed and trained like any other horse to be gorgeous, athletic candidates for just about any equine discipline that accepts all breeds as competitors. In 2011-12 portions of the



Young Horse funds will be used to promote responsible horse ownership, leaving enough for "start up" if the economy recovers sufficiently to resume receiving young horses in the fall of 2012.

Jersey Fresh

The Equine Science Center was well represented during Jersey Fresh May 11-15 at the Horse Park of New Jersey. Carey Williams assisted with cross-country course decoration and preparation during the days leading up to the event. Williams also participated as an Area Steward during cross-country in the area in front of the water complex, appropriately named "The Jersey Shore" and helped with the awards ceremonies on Sunday after the completion of the stadium jumping phase for each of the four divisions. Sarah Ralston and Tiffany Cody manned the Center's table in the vendor area on Saturday, while Karyn Malinowski and students Ryan Avenatti and Tim Manzi worked the table on Sunday.

FAIR Committee

Karyn Malinowski was recently appointed to the Food Animal Integrated Research (FAIR) 2012 program committee. The initial planning meeting was held May 20-21, 2011 in Washington, DC. The Food Animal Integrated Research group, a part of the Federation of Animal Science Societies, helps set the priorities for USDA's agenda for research and education. The FAIR acronym was changed to Farm Animal Integrated Research at the initial meeting; good news for the horse industry which traditionally is not recognized by USDA. The meeting will take place on March 4-6, 2012 in Washington, DC

Stakeholder Strategic Planning Meeting

Every year, the Equine Science Center convenes a Stakeholder Meeting which brings together diverse segments of the New Jersey horse industry with key faculty and staff associated with the Equine Science Center.

The meeting is designed to encourage open discussion in order to:

- Take the pulse of the industry
- Elicit feedback on Equine Science Center programs and strategies
- Identify the industry's current issues and concerns
- Share with our constituency the work of the Equine Science Center



Participants are reminded of the Center's mission: Better Horse Care through Research and Education to Advance the Well-Being and Performance of Horses and the Equine Industry. On October 15, 2010, more than 60 stakeholders gathered to focus their attention on horse health, integrity of the equestrian sport, land use and environmental stewardship, the future of the equine industry and other areas of concern. After evaluating recent Center accomplishments, open discussion amongst stakeholders was encouraged. Attendees expressed concern about obesity in

horses, NJDEP regulations of pesticide use in horses, equine nutrition, farmland assessment, classification of commercial farms, and unwanted horses.

Horse Management Seminar

The 2011 Horse Management Seminar was held on Sunday, February 13th and focused on “Care and Management of the Older Horse” where guest speakers Karyn Malinowski presented an “Overview of Older Horse Physiology”, Sarah Ralston presented an “Historic Look at Old Horse Nutrition”, Mike Fugaro of Mountain View Equine Practice & Centenary College presented “Orthopedic Problems in the Old Horse” and Jill Beech presented “Testing Geriatric Horses for Endocrine Diseases”. The seminar drew over eighty attendees, seven vendors with many door prizes, and about ten student volunteers. Guest speakers stayed for a panel discussion during the last hour of the seminar. Seminar organizer, Carey Williams commented, “Panel discussions are usually the most popular part of our seminars. People can ask questions regarding their own horse and get answers by the experts on the panel. Also if there is not enough time for questions after individual lectures, attendees can also ask questions during the panel.” Everyone should put Saturday, February 4, 2012 on their calendar for next year’s Horse Management Seminar!



Multi-Media

In an effort to continually implement new ways to experience its website, the Center added a Multi-Media webpage in spring 2010. The Multi-Media page features archives of staff interviews, Center videos, and other interactive media such as webinars, virtual tours, and the highly popular podcast series. The page provides easy access to a variety of educational tools to give the public a menu from which to select.

The Rutgers Equine Science Center launched a new innovative educational tool to its website – a virtual tour of the equine exercise physiology laboratory. The virtual tour is now accessible from the homepage of the Equine Science Center’s website: esc.rutgers.edu. The virtual tour features a photographic storyboard detailing the processes involved in successfully completing a graded exercise test (GXT) and a simulated race test (SRT), the two types of equine exercise tests conducted at the treadmill lab. The virtual tour has been divided into three categories: Preparing for an Exercise Test; Performing an Exercise Test; and Exercise Test Data Analysis. As visitors peruse the three categories, they will find pictures of various steps and stages of the test as well as descriptive text detailing each picture.

Webinar Series

The recent webinar series in Fall 2010 and Spring 2011 was a huge success. Participants could log on at their personal computers to learn about various topics in horse and farm management from the comfort of their own homes. The webinars were interactive, including a live lecture with a slideshow and an interactive chat feature where participants could ask questions or discuss the material with other Equine Science Center experts.

The fall webinar series covered a wide range of topics. The first lecture was “Nutrient Management Plan Training” by Jasen Berkowitz and Mike Westendorf. The second lecture, “Pasture Renovation and Weed Control,” was presented by Bill Bamka. Third, “Rotational Grazing for Happier, Healthier Horses and Pastures” was presented by Amy Burk from the University of Maryland. The last lecture was “Winter Care for Your Horse” presented by Carey Williams. Feedback from the webinars was positive. The educational value of the series was rated “Excellent” by 70% of respondents, with an overall score of 4.67 out of 5. Additionally, 48.3% of respondents reported that the webinar had a significant impact on how they will manage their farms or horses. Soil testing, mowing pastures, and less blanket use were practices that participants have reported that they will adopt based on what they learned in this series.

Spring webinars focused on “Care and Management of the Older Horse.” The first lecture, presented by Michael Fugaro, Associate Professor at Centenary College and owner of Mountain Pointe Veterinary Services, was titled “Orthopedic Problems in the Old Horse.” The second lecture was presented by Karyn Malinowski, director of the Rutgers Equine Science Center, and was titled “Overview of Older Horse Physiology.” Similar to the fall series, the spring webinars received great feedback. The educational value was rated a 4.88 out of 5, and the webinars had a moderate impact on 53% of respondents. Participants reported that they learned how important it is to keep older horses moving and exercising to keep them healthy.

Participants also reported that webinars are easy to use and convenient. Ninety-three percent of respondents had no difficulty with the directions and highly enjoyed the seminars. In the spring, 50% of respondents said that the webinar experience is much better than traditional extension programs. Participants appreciated the use of pictures, the interactive participation, and the ability to ask questions without interrupting the presentation. Eighty-seven percent of respondents were eager to participate in future webinars.

The Center is planning another series of Fall and Spring webinars for 2011/2012!

Awards

Carey Williams was awarded the USDA NIFA Partnership Award for 2010 as part of the eXtension HorseQuest leadership team. The award states “For developing and sustaining web content and a resource team of national experts providing innovative equine educational resources.” For more information on eXtension HorseQuest see the website at extension.org/horses.

Spirit of the Horse Award

Beginning in January 2006, the Equine Science Center was invited to present an award at the annual Breeders Awards Dinner of the New Jersey Department of Agriculture. This event highlights the achievements of the state's horses and horse people, culminating with the Governor's Trophy for the Horse Person of the Year. The "Spirit of the Horse" award recognizes individuals whose lives have been profoundly changed because of their involvement with horses and who have acknowledged the impact by giving back to the horse industry.

The Center named Peter Cofrancesco III as the 2011 recipient of the "Spirit of the Horse" award. Mr. Cofrancesco received the award during the 54th annual award ceremony on Sunday, January 30, 2011 from Sandy Denarski, chair of the Rutgers University Board for Equine Advancement, and Center director Karyn Malinowski.



8th International Conference on Equine Exercise Physiology in Cape Town, South Africa



In November, Kenneth McKeever, Carey Williams, and graduate student Danielle Smarsh extended the global reach of the Rutgers Equine Science Center with seven research presentations made at the 8th International Conference on Equine Exercise Physiology. The quadrennial meeting of equine exercise physiologists featured 124 oral and poster presentations of cutting edge research on all aspects of the athletic horse. The meeting, held in Cape Town South Africa, brought together more than 200 researchers from around the world.

Presentations from Rutgers included a keynote review entitled "*Cardiovascular Physiology Past and Present*", which was presented by McKeever and Cardiovascular Physiology session co - chair Rikke Buhl, from the College of Veterinary Medicine at the University of Copenhagen. A presentation titled "*Age related decreases in thermoregulation and cardiovascular function in horses*" was also made by McKeever with the take home message regarding the need for more information on the care of the aging athletic horse.

Efforts of Smarsh and recent graduate Nettie Liburt were highlighted in the presentation of two recent studies conducted at the Equine Science Center as part of the nutraceutical research funded by the Department of Defense. Smarsh's talk titled "*Oxidative stress and antioxidant status in intensely exercising horses administered nutraceutical extracts*" focused on the antioxidant effects of orange peel, tea, cranberries, and ginger. The paper by Liburt (presented by McKeever) "*Exercise-induced increases in inflammatory cytokines in muscle and blood of horses*" featured

information from the multi-institutional team that included Drs. Horohov, Adams, and Betancourt from the University of Kentucky. Important information on the nutrition of the athletic horse was featured in two presentations made by Carey Williams. The first titled, "*Nutrient intake during an elite level three-day event competition is correlated to inflammatory markers and antioxidant status*" was based on work from her ongoing collaborations with Amy Burk from the University of Maryland. The second, "*Nutrition - associated problems facing elite level three - day eventing horses*" was authored by GH Cook Scholar Elizabeth Leahy, Williams and collaborators Elizabeth Greene from the University of Vermont and Amy Burk from the University of Maryland. A poster presentation entitled "*Metabolic changes in four beat gaited horses after field marcha simulation*" featured a collaborative effort between Helio Manso, Filho (GSNB, 2005) and his team of researchers from the Universidade Federal Rural de Pernambuco, Recife, Brazil and McKeever.

Ernest C. Bell Scholarship

Melissa Reese, a senior at SEBS, was the recipient of the Ernest C. Bell Scholarship for 2011. The Ernest C. Bell Memorial Scholarship Fund was established by the New Jersey Equine Advisory Board to perpetuate Mr. Bell's memory and his ideals of courage and determination.

Business Operations

Marketing, Media and Public Relations



Objectives of the Center's recent marketing efforts were: 1) increase awareness and status of the Equine Science Center as the primary source for everything equine; and 2) generate financial support through the celebration of the Center's 10th anniversary.

The Center developed strategies to achieve those goals and employed several marketing and public relations tactics. One such tactic was the redesigned website launch in January 2011. The new homepage received positive feedback due to the ease of content navigation and streamlined search options. Additional benefits of the redesigned homepage include a rotating, clickable image slideshow prominently displayed in the center of the page as well as call-out sections for FYI, News, Events, and hyperlinked Partner logos. As requested, the Center added a new webpage to the site which chronicles racing-related publications and presentations. The "Horse Racing" page is available on the Center's website homepage.

To celebrate the Center's anniversary, the biannual newsletter, *Equine Science Center: UPDATE*, was also given a new look. In an effort to reduce the cost of print production and postage, the Equine Science Center introduced an electronic version of the newsletter. Subscribers to the e-newsletter receive an electronic copy of the spring and fall biannual issues as well as abbreviated supplemental winter and summer issues. To help the Center save on expenses related to printing and mailing the newsletter, opt-in for the e-newsletter by sending an email to esc@aesop.rutgers.edu.

In early 2011, the Equine Science Center launched its official Facebook fan page: esc.rutgers.edu/fb. With a growing number of fans, the Facebook page creates a sense of community among alumni, students, faculty, staff and equine enthusiasts. The page includes news, upcoming events, and even a discussion forum. The Facebook page is open to the public and anyone can join, although one must have a Facebook account to do so. A link to the page is available from the Center's website.

To coincide with the anniversary, the Center created a new celebratory advertisement which was featured in several equine publications including the Pennsylvania Equestrian and several times in Horse News.

What are the Top 10 Initiatives of the Equine Science Center? What are the Top 10 Ways the Center works for you and your horse? The 10th anniversary proved to be the perfect time to update the tri-fold brochure which details initiatives and ways all horse owners, irrespective of breed and discipline, benefit from the research and outreach of the Center. The "10/10" brochure was distributed to county offices throughout the state.

Lord Nelson, figurehead and mascot of Equine Science 4 Kids – the youth component of the Center's website, was also utilized in marketing plans for the Center's anniversary. Stuffed animals, similar in appearance to Lord Nelson, were available for purchase and temporary tattoos with his picture were given away at Equine Science Center events throughout the year. Youth of all ages enjoyed horsing around with Lord Nelson as they learned about Equine Science 4 Kids and the outstanding work of the Center.



Development was an essential element to the Center's celebratory marketing efforts. The Center collaborated with JK Design, an advertising and marketing agency, to produce an elegant Case Statement themed "For the Love of Horses". The case statement includes a letter from Karyn Malinowski, a brief overview of the Center's history and its integral role in the equine industry both nationally and internationally, and the Center's vision for the future. The attractive design and purposeful content of the case statement continues to receive praise and was recently recognized as the winning submission for the 2011 American Graphic Design USA Award.

In addition to rigorous marketing efforts and event planning, the Center also published three newsletters, over 18 press releases which resulted in numerous article placements and more than 350 Google Alerts.

Fund-Raising and Development

For the period of 2010-2011, \$249,380 was procured by faculty and staff in cash gifts, donations, and income from miscellaneous sources such as registration at events. Since its last Stakeholder Report, the Center welcomed a new Platinum Partner, Sandy Denarski.

The Center is taking commitment to new heights and has initiated an ambitious \$6.5 million campaign to expand faculty, research capabilities, programming and outreach. Friends and

supporters are invited to visit the Equine Science Center to learn about the pivotal role a meaningful gift can play in training new generations of knowledgeable, passionate equine advocates and specialists.

Horse Heroes

Mares in the research herd at the Rutgers Equine Science Center are Horse Heroes because they serve as participants in the varied research initiatives which positively benefit the greater equine community. The herd consists of 23 Standardbreds, many of which are former racehorses. Horse Heroes in the research herd contribute to knowledge of horse health by assisting equine scientists and students to advance the well-being and performance of all horses and the equine industry. Recent studies conducted at the Equine Science Center include: the effects of age and training on glucose metabolism; how specific gut-derived bacteria could influence the development of laminitis; environmental best management practices on a horse farm; exercise physiology of the older horse; and numerous other studies. By sponsoring a Horse Hero, You can be a Hero, too! To view individual profiles of mare in the herd, visit esc.rutgers.edu and click Horse Heroes.



New Jersey State 4-H Horse Show Benefits the Equine Science Center

The 2011 New Jersey State 4-H Championship Horse Show included a division in its prize list: the Equine Science Center Benefit Fun Show. Intended to recognize the Center for its contributions to the equine industry, the show featured classes and games sponsored by participating 4-H counties. The show, which was held at the Horse Park of New Jersey from Friday, September 9 - Sunday, September 11, raised \$500.00 for the Center.

Women of Influence

Beginning in the fall of 2009, the Center began hosting intimate dinner parties with “Women of Influence” who are members of the “Community of ‘50’ for Equine Excellence. The purpose is to engage influential women in the horse industry in networking opportunities and to discuss issues of importance to the Equine Science Center and the horse industry.



On May 26, Women of Influence member Hartley du Pont hosted a lunch and learn lecture at the home of Mitzi Purdue in Manhattan. Karyn Malinowski presented the lecture – “Do You Age Like a Horse?” - addressing the similarities between horse and human aging and physiology.

NOTES



Equine Science Center Celebrates 10 years

With 10 years of accomplishments toward fulfilling its mission of Better Horse Care through Research and Education, the Equine Science Center has positioned itself as the primary resource for everything equine.

As the Center embarks on its next chapter, it will continue its remarkable success in ensuring the well-being of horses and the equine industry with high-quality, cutting-edge research and educational programs that impact horse owners and equine enthusiasts worldwide.

To achieve the next level of excellence, the Center endeavors to establish an endowment, which will solidify its future for the equine industry and the beloved animals it serves.



To learn more about the Equine Science Center or to make a donation, please call or visit us online

732-932-9419

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