



2nd AAEP Foundation Lameness Research Workshop
Oklahoma City, Oklahoma
July 24-25, 2012

On July 24-25, 2012, following the AAEP Focus meeting on hind limb lameness, an AAEP Foundation research panel met to update research priorities for equine lameness. During the first half-day the following researchers made presentations on a variety of topics as an update on the current status of research focused on lameness.

Objective Evaluation of Lameness: *Kevin K. Haussler, DVM, DC, PhD, Diplomate ACVSMR*

Imaging Biomarkers of Orthopedic Disease: *Christopher E. Kawcak, DVM, PhD, Diplomate ACVS & ACVSMR*

The Use of Diagnostic Ultrasonography in Evaluating Lameness *Mary Beth Whitcomb, DVM*

The Use and Place of MRI in Lameness Diagnosis: *Natasha M. Werpy, DVM, DACVR*

The Current Status of Fluid Biomarkers: *Peter Clegg, VetMB, MA, PhD, CertEO, Diplomate ECVS, MRCVS*

Current Evidence on Treatments of Joint Disease: *David D. Frisbie, DVM, PhD, Diplomate ACVS & ACVSMR*

Blood Products for the Treatment of Joints: *Alicia L. Bertone, DVM, PhD, Diplomate ACVS*

Current Status of the Use of Mesenchymal Stem Cells: *C. Wayne McIlwraith, BVSc, PhD, DSc, FRCVS, Diplomate ACVS & ACVSMR*

Effects of Exercise on Musculoskeletal Tissue and Use of this Knowledge in Training Protocols: *P. René Van Weeren, DVM, PhD, Diplomate ECVS*

Current Options for the Treatment of Tendonitis: *Alan J. Nixon, BVSc, MS, Diplomate ACVS*

Where are we with Rehabilitation and What Scientific Validation is there? *Steve Adair, MS, DVM, Diplomate ACVS & ACVSMR*

The Science of Racetrack Technology & its Management: *Christie A. Mahaffey, PhD*

Sponsors

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- Boehringer Ingelheim Vetmedica, Inc.
- Grayson-Jockey Club Research Foundation
- Merck Animal Health
- Morris Animal Foundation
- Soft-Ride Deep Gel Boots

2nd AAEP Foundation Lameness Research Priority Planning Panel Report

The second half-day of the panel dedicated discussion to select the most important areas for future research and an attempt to determine the funding required to make progress on specific problems or research areas. Researchers were asked to send 5 questions on equine lameness they would like answered. These questions covered a wide range of topics and represented the diversity of problems, which relate to equine lameness. The wide array of lameness problems created a challenge to focus the priorities. The panel first identified and ranked the most important problems. Though several different diseases were considered, it was clear that the basic pathophysiology is often similar. There was final consensus that each disease category can serve as a model for numerous lameness problems. Four areas were chosen as the focus of future research: 1) Rehabilitation and Physiotherapy; 2) Improved Diagnostic/Imaging Techniques; 3) Use and Benefits of Regenerative Medicine; and 4) Injury Prevention & Risk Assessment.

Breakout groups were assigned to the primary areas of research priorities, and charged with identifying the scope and priority for each topic. The goal was to select the most important research projects and the estimated investment needed to generate new information applicable to the horse with lameness. All the groups were concerned about education of the horse owner and trainer about the new technologies and the scientific evidence that now exists. There is a particular need in the areas of regenerative medicine and rehabilitation/physiotherapy, which are relatively new treatment modalities with a great need for more evidence for their use and effectiveness. Standardization of imaging techniques and reporting are needed to allow comparison of data from collaborating researchers and clinicians. Imaging normal horses to allow direct comparison between several modalities is needed to determine what is normal in working horses. Use of histology is needed to classify changes detected by different imaging modalities as either normal or abnormal. Though clinical trials are difficult to complete, the true effects of some treatments need to be tested in the patient rather than in experimental models. Following horses over time while racing or in competition is needed to determine the effect of medications and training methods is needed to help promote prevention.

Estimates for the amount of funding are based on researcher experience, needed technical support, technology and duration of many of these studies. In some cases costs could not be accurately estimated. Support for the researcher is now needed to make time in faculty positions available for the research. It was clear after the deliberations of the panel that the need for funding has never been greater to make sure advances are made using scientific methods. The expansion of treatments for lameness without the backing of research is costly and cannot be justified scientifically.

The following outlines provide the items discussed and the need for specific research to help answer some of the questions posed before and during the panel presentations.

I. Notes from Imaging breakout group: *Natasha Werpy, Mary Beth Whitcomb, Rich Redding, Chris Kawcak, Matt Brokken.*

1. Multimodality studies, including ultrasound and recheck examinations – (30 horses budget estimate: \$300,000).
 - a. Imaging non-clinical regions of horses at the same time as imaging clinically affected regions.
 - i. For the purpose of determining what levels of hind suspensory ligament abnormalities (ultrasound and MRI) are present in performance horses, yet do not result in lameness.
 - ii. Standardize assessment of clinical disease to be used in the study. Include cases of deep digital flexor tendon, suspensory ligament and fetlock lesions in racehorses.
 - b. Recheck studies on cases of SL injury following treatment and rehab program with multimodality imaging.
 - c. Goals.
 - i. Findings in SL in sound, competing horses.
 - ii. How to localize the pain in ligaments and bone.
 - iii. Define the pathophysiology of suspensory desmitis.
 - iv. Correlation of MRI and US in clinically affected areas for the purpose of comparing different imaging modalities.
 - d. Possible Funding.
 - i. Grayson Jockey Club Foundation.
 - ii. United State Equestrian Federation.
 - iii. Morris Animal Foundation.
2. Standardization of imaging studies – sponsored meeting to discuss and incorporate information from Project #1 (Budget Estimate: \$50,000).
 - a. Develop standardized study methods for the profession.
 - b. Standardization of ultrasound techniques for different anatomic regions.
 - c. Publish and present information to educate the veterinary profession.
3. Assess healing with multimodality imaging with conformation by histologic studies.
 - a. Define the disease process for diseases with experimental model.
 - b. Utilize clinical cases with recheck imaging; use multicenter study.

- c. Studies on the collateral ligament of the distal interphalangeal joint, deep digital flexor tendon in foot, distal sesamoidean ligament, proximal suspensory ligament (requires high field MRI).
 - d. Potentially could use standing MRI after initial study on high field MRI
 - e. Need for histologic correlation with clinical disease.
4. Investigate new and innovative technologies – need industry support.
- a. Improved imaging hardware and software.
 - b. Assessment of nerve fibers.
 - c. Elastography.
 - d. Fusion Imaging.

II. Notes from Regenerative medicine group: *Alicia Bertone, David Frisbie, Alan Nixon, Peter Clegg, Wayne McIlwraith, Allyn Mann*

1. Agreement that a white paper aimed at veterinarians and clientele to be drafted by this group.
 - a. Draft of document to include new data and references.
 - b. Review by the group to finalize the white paper.
 - c. Work with AQHA, USEF, AHC and others to distribute the white paper to horse industry organizations and affiliations.
2. Research.
 - a. Investigate a dose response study of stem cells in a tendinitis/arthritis model and a subsequent long-term study for best dose (Budget Estimate: \$500,000, with potential support from the industry).
 - b. Investigate route of administration of stem cells for distal limb in clinical cases such as navicular disease and laminitis.
 1. Retrograde IV versus intra-arterial versus direct into the tissue to determine if cells arrive at sites of disease and cause no harm in disease animals (Budget Estimate: \$250,000).
 - c. Compare PRP and embryonic or fetal SCs, and MSCs in tendinitis/joint models (Budget Estimate: \$250,000).
 - d. Investigate safety of allogenic cells compared to autogenous cells in specific models such as tendinitis/joint. Include studies on immune reaction and inflammatory response (Budget Estimate: \$250,000).

III. Rehabilitation-Physiotherapy: *Duncan Peters, Steve Adair, and Kevin Haussler*

1. Develop pilot studies using in-vivo tissue lesion models to validate objective outcome measures needed to assess the clinical effects of various physical modalities and therapeutic exercises.
 - a. Develop primary lesion models include tendonitis (mechanical or chemical), osteoarthritis and synovitis (carpal chip or chemical), dermal (wounds).
 - b. Develop secondary lesion models include muscle (hypertonic saline) and nerve (neuropathic pain).
 - c. Primary outcome measures include functional or clinical sign modifying parameters such as ground reaction forces, joint range of motion, pain, postural sway, proprioception, motor control, and strength.

- d. Secondary outcomes include structural or disease modifying changes such as diagnostic imaging, clinical pathology and histology.
- 2. Proof of concept for lesion models in #1.
 - a. Evaluation of the following physical modalities. (Budget Estimate: \$20,000-\$50,000 per lesion type/modality)
 - 1. Therapeutic ultrasound (tissue heating capabilities, collagen extensibility).
 - 2. Low-level laser therapy (penetration, wound healing, analgesic effect).
 - 3. Thermal therapies (penetration in different tissue types, effects on inflammation, effects on local blood flow).
 - 4. Pulsed electromagnetic therapy (clinical effects, effect on local blood flow).
 - 5. Therapeutic exercises focused on proprioception, motor control and strength would also need to be evaluated for changes in functional outcome parameters for each of the above lesion models.
 - b. Sample size = 2-6 horses per lesion type/modality.
 - c. Develop comparative studies to determine optimal rehabilitation protocols the specific tissue lesion models in #1 are based on
- 3.
 - a. Evaluation of dosage variables, efficacy, adverse effects and safety.
 - b. Sample size = 16-20 horses per lesion type/modality
- 4. Initiate clinical, randomized, controlled studies (Budget Estimate: \$50,000-\$300,000 per lesion type/modality).
 - a. Evaluate indications, contraindications, and efficacy in naturally occurring disease processes within specific tissues.
 - b. Assessment of efficacy in acute and chronic disease processes is also needed.
 - c. Sample size = 30+ horses per lesion type/modality.

IV. Injury Prevention & Risk Assessment: *Nat White, Larry Bramlage, Christie Mahaffey, René Van Weeren*

- 1. Develop and utilize the Injury Database (Budget Estimate: \$150,000 for technician to follow the horse and collect the data).
 - a. Correlation (use equine injury database) w/ track surface & injury
 - b. Medication versus injury – requires information during the 3months prior to the injury
 - i. Follow the horses in a cohort study
 - ii. Use the regulatory system for data collection
 - c. Areas of study
 - i. Treatment of joints w/ corticosteroids
 - ii. Number of injections vs. injury
 - iii. Training methods vs. incidence of injury
- 2. Monitoring of tissue changes over training and competition (Budget Estimate: \$200,000).
 - a. Racing, show jumping
 - i. Ultrasound - follow monthly
 - ii. Tissue change during training and exercise
 - 1. Ultrasound

2. MRI
3. CT
3. Development in foals comparing restricted exercise (Budget Estimate: \$500,000).
 - a. Examine the first 5 months of life
 - b. Control for activity in comparison groups
 - i. Optimize development during growth
 - ii. Correlate development to future performance