Lameness Research Meeting and Panel Report
Fort Collins, Colorado
August 1, 2007

The concept for the 2007 Lameness Research Meeting and Panel was developed by the AAEP Foundation Advisory committee. Similar to other research panels organized by the AAEP Foundation the lameness meeting and panel was designed to share collective knowledge, current studies and future plans among multidisciplinary equine lameness researchers in order to help develop strategic priorities to most effectively and economically address important diseases that cause lameness. Furthermore, the panel was challenged to develop a plan for investigator collaboration and to identify specific priorities in lameness research for the next 5-10 years.

The meeting and panel were held the day following the AAEP Focus Meeting in Fort Collins, Colorado on August 1. A total of 24 researchers and lameness experts from around the world met to prioritize future lameness research. The meeting format included abstract presentations by 12 panelists during the morning session to provide information about the current state of the art in several areas of research. A round table discussion and breakout sessions were held in the afternoon to answer specific questions about the direction and cost of future research in equine lameness.

The panel was moderated by Rick Mitchell, DVM and Nat White, DVM, MS, Diplomate ACVS. The following individuals presented abstracts to summarize the current research and identify the most likely direction research should take in the next few years.

Diagnostic Techniques - Andrew P. Bathe, MA, VetMB, Diplomate ECVS, DEO, MRCVS
Local Anesthesia - Michael Schramme, DVM, CertEO, PhD, Diplomate ECVS
Gait Analysis - Hilary M. Clayton, BVMS, PhD, MRCVS
Force Plate Analysis - Paul René van Weeren, DVM, PhD, Diplomate ECVS
Epidemiology - Ellen R. Singer, DVM, DVSc, Diplomate ACVS & ECVS, MRCVS
Bone Remodeling - Christopher E. Kawcak, DVM, PhD, Diplomate ACVS
Joints and Arthritis - C. Wayne McIlwraith, BVSc, PhD, DSc, FRCVS, Diplomate ACVS
Tendon Injury - Roger K.W. Smith, MA, VetMB, PhD, DEO, Diplomate ECVS, MRCVS
NSAIDS - Melissa D. Sinclair, DVM, DVSc, Diplomate ACVA
Corticosteroids - David D. Frisbie, DVM, PhD, Diplomate ACVS
Stem Cells - Lisa A. Fortier, DVM, PhD, Diplomate ACVS
Alternative Therapy - Kevin K. Haussler, DVM, DC, PhD

The following veterinarians also participated in the panel discussions.
Jerry B. Black, DVM
Larry R. Bramlage, DVM, MS, Diplomate ACVS
R. Reynolds Cowles, Jr., DVM

Eleanor M. Green, DVM, DACVIM, DAVBP
Brad Jackman, DVM, MS, Diplomate ACVS
Kevin G. Keegan, DVM
Tom R. Lenz, DVM, MS, DACT
Mark J. Martinelli, DVM
Sergio H. Salinas, MVZ
Robert K.Schneider, DVM
Stephen G. Soule, VMD
Tracy A. Turner, DVM
Harry Werner, VMD

Round Table Panel Discussion

The general round table discussion highlighted individual ideas of what was considered the most important areas needing research. The specific areas considered most important included: prevention of articular cartilage damage, development of tests for early diagnosis, characterizing surfaces for training and performance for all types of horse use, and use of epidemiology to define risk factors to help with prevention and determining cause and effect. Epidemiology was considered important by a number of individuals with emphasis on such diseases as navicular disease, suspensory desmitis, and various joint injuries. Use of epidemiologic studies will require specific definition of the diseases and will require tracking horses to determine incidence and change over time. The same type of tracking of horses and horse families will be required to study genetic traits and for genetic screening. Feedback to the industry was felt to be necessary to help disseminate new information and to engage owners in horse tracking and data collection.

Studies to characterize bone injury and to determine causes and effect of training are needed, but for all types of athletic use. Early detection of lameness problems was frequently mentioned as critical to help prevent injuries. Research to develop new treatment modalities in the areas of regenerative medicine and intra-articular therapies is needed.

Others described the need for research to improve imaging and the consistency of imaging, the need for new models of disease for research and the need for prospective clinical trials which are double blind and which have defined outcome parameters.

The recurrent theme from many of the participants at the round table was the need to define risk factors to establish disease and injury trends in order to find preventions. Furthermore collaborations between different disciplines will be necessary to complete much of the research. Engineers will be needed to help with performance surface characteristics as well as for the assessment of load and strain on the affected tissues. Molecular biologists will be needed to help develop new methods in regenerative medicine.

Because lameness covers such a vast number of topics related to the equine musculoskeletal system, investigators in specific areas of research will likely need to meet in smaller groups to plan the next stage in the process for each area.

Breakout Sessions
After the round table discussion, the panel was divided into breakout sessions to deliberate on the following topics.

1. Joints, Tendons and Ligaments
2. Kinetics and Prevention
3. Bone and Foot
4. Lameness Diagnosis and Treatment
5. Imaging

Each group was asked to answer the following questions.

1. Name four areas of research that should have a priority for the next five years.

2. How should each of these areas be investigated and what type of collaboration among investigators is needed to make a significant advance in this area.

3. Estimate the funding required to making a significant advance (i.e. new diagnostic tool, new treatment, preventative measure)

The following is the results of the deliberations for each breakout area.

<u>Break out topic: Joints, Tendons and Ligaments</u>
Panelists: Frisbie, McIlwraith, Smith and Fortier

Recommendations for research included:
1) Epidemiology – Goal to define what the specific problems are based in each discipline
-Studies should be focused at the level of the trainer
- Expand studies by discipline - Cutting, reining etc.
-Determine risks and outcomes
-Prospective studies
Estimated cost $600,000

2) Biomarkers - Goal to identify the population at risk of injury
-Samples for both mRNA and protein analysis should be collected for multiproject use.
Estimated cost $1.2-1.5 million

3) Cellular Biologics – ie Stem cells
-Better characterize adult stem cells
Estimated cost $100,000
-Initiate positive controlled clinical trials to determine outcome for musculoskeletal disease
Estimated cost $800,000

4) A summit on joints, tendons and ligaments for in-depth planning and the development of *in vitro and in vivo* models
Estimated cost $50,000

Break out topic: Kinetics – Prevention
Panelists: Clayton, Singer, van Weeren and Keegan

Recommendations for research included:
1) Epidemiology study – based on different horse use
- Cohort studies
- Distance, velocity and surface characteristics
- Record training injuries
- Case control or cohort study
-4 years for each type of performance

Estimated cost $500,000 for each sport

2) Surface testing requires development of a 3-Dimensional accelerometer/gyroscope system to describe acceleration and orientation of the hoof.
-Triaxial accelerometer and gyroscope – attached to hoof, light weight and wireless
-Able to describe acceleration and orientation under field conditions
- Develop analytic software
-Requires collaboration of engineers, veterinarians and graduate students

Estimated cost $100,000 to develop
Estimated cost $100,000 for validation

3) Develop a practical and objective method to quantify gait and gait abnormalities in the field. The system should be:
-Accurate/Repeatable and observer independent
-Reasonable cost
-Easy data interpretation by veterinarians
- System should be tested in three independent gait labs

Estimated cost $250,000

4) Develop (finite element) models of limbs to calculate internal forces based on external data (kinematics, kinetics, EMG)
Estimated cost not determined

5) Rehabilitation
-Techniques – Which ones are valid?
-Develop and validate new techniques to restore full athletic function with minimal interruption of the training schedule

Estimated cost not determined

Breakout topic: Bone and Foot
Panelists: Kawcak, Jackman, Cowles, Turner and Bramlage

Recommendations for research in bone and bone disease included:
1) Trigger for pathologic change
-Mineral characteristics
-Biochemical markers
-Differences over time
Estimated cost not determined

2) What is the trigger or threshold needed for bone adaptation?
-Sample bone
-Look for markers
-Training from stall vs. training with turn out.
-Various breeds and uses
Estimated cost not determined

3) Management techniques
-Determine incidence of disease
-Comparison of environment after training
-Stall plus training vs. turn out plus training.
Estimated cost not determined

4) Trigger for bone change in different breeds
Estimated cost not determined

Recommendations for research for the foot included:
1) MRI – Hoof capsule characteristics
-Look for changes in hoof growth
-Changes in hoof with use
Estimated cost not determined

2) Hoof surface interaction
-Change with different surfaces
-Effect of shoes etc. Develop methods for quantification of hoof interaction
Estimated cost not determined

3) Stimulate hoof growth
-Characterize how mechanics can change growth
-Determine the effects of environmental factors
Estimated cost not determined

4) Multicenter study
-Incidence of caudal hoof pain
Estimated cost not determined

5) MRI to determine hoof characteristics
-Follow feet changes sequentially during use
Estimated cost not determined (see imaging)

6) Hoof surface interaction such as injury incidence on polytrack surface
Estimated cost not determined

Breakout Topic: Lameness Diagnosis and Treatment
Panelists: Mitchell, Soule, Haussler, Sinclair, Black and Bathe

Recommendations for research included:
1) Standards for MRI
-Positioning
-Sequences
-Normal anatomy
-Develop a consortium
-Hold a summit to establish standards for interpretation
Estimated cost $100,000

2) Pathogenesis of proximal suspensory desmitis
-Imaging
-Histology
-Grading system
-Case based
-Multiple age groups
- Concentrate on English sport horse

-Involve insurance companies
Estimated cost $300,000-400,000

3) Assess SI pain
-Clinical trial
- nerve bloc
- scintigraphy
- exercise vs. injection vs. no-RX

Estimated cost $300,000

4) Validate joint RX – that have minimal clinical studies
-IRAP ®
-Steroid + HA
-Shockwave RX
-I.A Adequan®
-Stem cells
-Multicenter study
- Clinical Protocol – Standardized
- Prospective studies

Estimated cost $100,000

Breakout Topic: Imaging
Panelists: Schneider, Schramme, Martinelli and White

Recommendations for research included:
1) MRI developed for navicular disease
-Characterize histology vs. imaging
-High vs. Low field magnets
-Multicenter magnet studies
Estimated cost $1,000,000

2) Comparison of MRI with other imagery
Estimated cost $100,000

3) MRI corroboration
-post mortem for back anatomy and injury
-Correlate ultrasound and radiographs
Estimated cost not determined

4) Improve cartilage imaging
-MRI
-CT
Estimated cost not determined
5) MRI – Laminitis
-Experimental –
-Evaluation of chronic laminitis
-Clinical prognosis
Estimated cost not determined

Summary

It was apparent from the discussions that there are numerous areas that need more research with some needing a significant investment of resources to find solutions for diseases or diagnostic techniques. The incidence and economic importance of specific diseases is not known and this information is needed to help prioritize research funding. At the same time studies which track these diseases can help define the risk factors, which once identified can be used to decrease disease incidence and morbidity. It is apparent that investigators in specific areas of lameness such as joint disease, kinematics, imaging and therapeutics will need collaboration between a variety of experts in several non-veterinary specialties such as engineers and topic specific scientists to tackle some of the problems listed by the panel. In some cases more specific panel discussions will be necessary to further focus the priorities in a specific area.

Laminitis was not discussed at this forum, as a research summit specifically for laminitis was held in 2004. The need for laminitis research has been established and remains a high priority for the industry.

The investigators and clinicians owe special thanks to the sponsors for making this research meeting and panel possible. Sponsors for this meeting included: AAEP Foundation, AQHA Foundation, Boehringer Ingelheim Vetmedica, Inc., Grayson-Jockey Club Research Foundation, IDEXX Laboratories and Morris Animal Foundation. This cooperative effort is helping to identify priorities for lameness research and will benefit the owner, veterinarian, supporting industries and most importantly the horse.

Dr. Nat White
Dr. Rick Mitchell
9-25-07

How Donors Can Help -

There are many ways and locations that donations can be made to help horses through enhanced equine research.

AAEP Foundation
While the AAEP Foundation does not fund research directly, it does help through the coordination of research by hosting events such as this Lameness Research meeting and panel. The Foundation helps with research by educating veterinarians and horse owners own proper horse health, provides scholarships to veterinary students and it makes pass-through donations to other funding agencies that directly support equine research studies. To learn more about or to make a donation to the AAEP Foundation, please visit here: www.aaepfoundation.org.

Other organizations that fund equine research projects directly and would be perfect outlets for donations include:

AQHA Foundation
http://www.aqha.com/foundation/equineresearch/applydonate.html

Grayson-Jockey Club Research Foundation
http://www.grayson-jockeyclub.org/

Morris Animal Foundation
http://www.morrisanimalfoundation.org/apply/?section=2,0

We also recommend that you contact a veterinary college or university in your area. Veterinary schools that do equine research may be found worldwide. To find an institution in the U.S. visit here: http://www.aavmc.org/

Should you need assistance finding a school you would like to donate to, please contact the AAEP Foundation office toll free in the U.S. at 1-800-443-0177 or direct at 859-233-0147 or via e-mail at aaepoffice@aaep.org.

The AAEP Foundation, Inc. (www.aaepfoundation.org), a 501(c) 3 organization, was created in 1994 as the charitable arm of the American Association of Equine Practitioners. The AAEP Foundation's mission is to improve the health and welfare of the horse through support of research, education, benevolence and the equine community.