



## **2011 Research Funded by the Arabian Horse Foundation -Project Summaries-**

### **Cerebellar Abiotrophy Project**

- **Cecilia Penedo, PhD/University of California, Davis – Veterinary Genetics Laboratory (VGL)**

In February 2011, the Penedo group published a paper in the journal, Genomics, describing the identification of a mutation associated with cerebellar abiotrophy (CA). Of the four genes located in the CA region, two of them (MUTYH and TOE1) have some brain involvement and partially overlap one another. Because this mutation is tied to more than one gene, the VGL is conducting further study of the two candidate genes, MUTYH and TOE1. Part of this ongoing work includes “expression studies” to help evaluate the functional aspects of these two genes and determine what effect this mutation has on them. Obtaining this information will help researchers gain a better understanding of what initiates degeneration of the Purkinje cells and allow for final confirmation of the causative mutation for CA. More detailed information on the CA Research Project and the development of the CA DNA test can be found at <http://www.arabianhorsefoundation.org/news.html>.

### **Studying Susceptibility of Gray Horses to Skin Cancer (co-sponsorship with the Morris Animal Foundation)**

- **Molly McCue, DVM, PhD/University of Minnesota**

Melanoma, a primary skin tumor, affects about 80 percent of gray horses over the age of 15. Although melanomas begin as small, slow-growing tumors, over time most of them metastasize to distant sites, resulting in systemic complications and decreased longevity. It is well known that gray coat color predisposes horses to the formation of dermal melanomas. However, some gray horses seem to be protected from the development of melanoma. The reason for the decreased incidence of melanoma in these horses is unclear. This study will classify melanoma patients into risk categories based on genetic predispositions. The goal is to provide veterinarians with information that will help them identify patients that are candidates for early intervention, when therapy options are more plentiful.

### **Genetic Mapping of Equine Metabolic Syndrome and Cushing’s Disease**

- **Samantha Brooks, PhD/Cornell University**

The project began with a retrospective study of records from samples submitted to the Diagnostic Endocrinology and Clinical Pathology Laboratories for diagnostic measurement of serum insulin and plasma ACTH. This study produced the first documentation of the frequency by breed of elevated plasma ACTH (indicating a likely diagnosis of Equine Cushing’s Disease/Pituitary Pars Intermedia Dysfunction, PPID) and hyperinsulinemia (suggesting Equine Metabolic Syndrome, EMS). Based on these data the Arabian horse was chosen for further study as it has a moderate risk for EMS and historically contributed to the development of many breeds.

Owners are being recruited to participate through the contact information for their referring veterinarians as submitted to the Animal Health Diagnostic Center. Sample kits from over 150 horses have been collected to date for genetic mapping. Data on these horses includes DNA, brief health and diet histories, body measures, photos and parentage information. Preliminary association analysis for these samples has been completed and several significant loci have been located. These results are clearly preliminary, and much work is needed to investigate genes in these regions, identify functional markers and validate these markers in larger groups of horses, and in additional breeds. For more information visit: [http://www.ansci.cornell.edu/brooks/met\\_description.html](http://www.ansci.cornell.edu/brooks/met_description.html)

## 2011 Research Funded by the Foundation Project Summaries (continued)

### Equine Hoof Interaction with the Ground Surface: The Impact of Trimming and Hoof Conformation

- Babak Faramarzi, DVM, MSc, CVA, PhD/Western University

The mechanical properties of the hoof wall are dictated, to a large extent, by its structural arrangement and shape. It has been estimated that more than 30% of lameness in horses is associated with foot problems. Mechanical loading is considered to be one of several stimuli that cause changes in the shape and morphology of equine hooves; however, supporting evidence for any response to this form of stress is circumstantial. Failure of individual bones and soft tissues of the musculoskeletal system and lameness are major concerns of the equine industry from the perspectives of health and welfare of horses and of economic losses (e.g., treatment costs and days lost for racing and training). Therefore, knowledge of the responses of hooves to mechanical stress is relevant to issues of health and well being for horses.

The few available studies are focused on Thoroughbred, Standardbred, and Quarter horses while Arabian horses are underrepresented. Arabian horses are well known for stamina and endurance while Thoroughbred and Quarter horses are known for their speed. It has been shown that anatomy and the moment arms of the pelvic limb muscles are different between Arabian and Quarter horses while the difference in hoof loading and forces has not been studied. Uneven distribution of forces imposes excessive stress on regions of the foot and associated ligaments, which leads to musculoskeletal injuries. By using specific trimming/shoeing techniques (techniques vary between horse breeds and disciplines), farriers aim to improve the performance of horses. However, the outcome of those techniques on force distribution and foot biomechanics has not been studied in Arabian horses. Our 1<sup>st</sup> goal is to study the correlation between hoof anatomy and force distribution and our 2<sup>nd</sup> goal is to study the changes in force distribution in response to the changes in the hoof anatomy, i.e., trimming. The ultimate goal is to identify and prevent pathologies which arise from changes in normal anatomy and biomechanics of the foot.

Fore feet of 20 adult, sound Arabian horses will be examined morphologically and radiographically. The hoof anatomy will be examined by taking radiographs and digital pictures. Horses' age, gender, height, weight, discipline, and exercise regimen will be recorded. The radiographs and digital images will be transferred to a laptop and using specific software 18 linear and angular variables will be measured including: wall and sole width and length; hoof angle at the toe, heel, and quarters; and solar circumference. On the radiographs, the distance between the distal phalanx and the hoof wall, the thickness of the sole, and the size of the distal phalanx will be measured. Hoof impact (i.e., force distribution) will be measured using a specialized pressure platform. To assess the effect of trimming, the measurements will be done before and after trimming.

This project has been presented to and being approved by (IACUC; Western University of Health Sciences) Animal Care Committee.

**The Arabian Horse Foundation thanks our donors for their ongoing support of important equine health research projects. For more information about the Foundation and becoming a donor, please visit [www.arabianhorsefoundation.org](http://www.arabianhorsefoundation.org).**