The Horse Species Symposium titled “Exercise physiology of the horse” was held at the Joint Annual Meeting of the American Dairy Science Association and American Society of Animal Science in Orlando, FL, July 12 to 16, 2015. The purpose of the symposium was to discuss recent research findings related to equine exercise physiology with topics including oxidative stress, mitochondrial function, bone and muscle, and biomechanics. The symposium comprised 4 invited presentations.

The symposium began with an invited presentation by C. A. Williams (Rutgers University, New Brunswick, NJ), who discussed the effect of oxidative stress during exercise in the horse. The equine athlete often undergoes oxidative stress, particularly during endurance and eventing competitions. Williams (2016) described the influence of age, diet, and conditioning on the oxidative status of exercising horses. Oxidative stress—the imbalance of oxidants to antioxidants in the body—is influenced by both exercise intensity and the diet of the equine athlete. Supplementation of antioxidants, such as vitamin E, vitamin C, and α-lipoic acid, yielded positive changes in exercise-induced oxidative stress, resulting in increased performance. Exercise training increased antioxidant status and reduced oxidative stress markers in mature horses, but younger horses experienced few changes. This indicates that younger horses have a greater defense against oxidative stress. These data concerning antioxidant status and lipid peroxidation, much work still remains to fully understand the impact of strenuous exercise on oxidative damage and aging in the horse.

The second invited presentation, by C. Li (University of Florida, Gainesville), focused on the effects of aging on mitochondrial function in skeletal muscle of quarter horses. Despite documented age-related reductions in physical function and skeletal muscle mitochondrial function in other species, many equine athletes are still active and successful beyond 20 yr of age. Li et al. (2015) describe a project from their laboratory where muscle biopsies were obtained from young and aged horses to determine age-related changes in muscle fiber and mitochondrial function. They found greater proportions of oxidative type I myosin heavy chain (MHC) isoforms in older horses and reduced glycolytic type IIX MHC. The proportion of intermediate type IIA MHC was not impacted by age. Aged horses had decreased electron transport capacity and cytochrome c oxidase activity. The speaker concluded that age impacts the fiber type and mitochondrial function of equine skeletal muscle.

The third presentation, by K. F. Duesterdieck-Zellmer (Oregon State University, Corvallis), addressed the adaptation of bone and muscle to endurance exercise. Although a great deal of research has concentrated on flat racing horses, endurance horses also experience great adaptation of muscle and bone to exercise. As the speed of these races increases, so does the incidence of fractures from high-speed impacts. Understanding the adaptation of bone and muscle to exercise is essential for the prevention and treatment of fractures in endurance horses. Duesterdieck-Zellmer discussed the adaptation of bone and muscle to endurance exercise, including changes in bone density, muscle fiber type, and mitochondrial function. She also highlighted the importance of proper nutrition and exercise conditioning to optimize the adaptation of bone and muscle to endurance exercise.