Variants within Genes Tspan18 and NRG3 Associated with Angular Limb Deformity in Rambouillet Rams. Gabrielle M. Becker¹, Julia Woods¹, Christopher S. Schauer¹, Brett T. Webb¹, Whit C. Stewart¹, Brenda M. Murdoch¹, ¹Department of Animal, Veterinary and Food Sciences, University of Idaho, ²Hettinger Research Extension Center, North Dakota State University, ³Veterinary Diagnostic Laboratory, North Dakota State University, ⁴Department of Animal Science, University of Wyoming

Abstract: Incidence of angular limb deformities (ALD) have been described in many species of livestock and companion animals. Young, rapidly growing animals are at an increased risk for developing ALD. Although work has been done to identify the casual genetic basis of ALD, bone deformities are likely influenced by the environment, making clear genetic answers challenging to discover. Rambouillet rams from Wyoming, North Dakota and South Dakota annual ram performance tests have been observed to develop limb abnormalities consistent with ALD. Historical incidence of ALD in test rams has ranged from 3 to 18%. A genome-wide association study (GWAS) was conducted with 342 ram-test animals, including 40 ALD-affected rams and 302 unaffected rams collected over three consecutive years. Significant markers were identified within the genes tetraspanin 18 (TSPAN18; p-value = 4.87e-07) and neuregulin 3 (NRG3; p-value = 8.06e-07). In mice, Tspan18 has been proposed as a regulator of endothelial cell Orai1/Ca²⁺ signaling. Orai1 has also been shown to mediate osteogenic differentiation via the bone morphogenetic protein signaling pathway, which suggests the possibility for TSPAN18 involvement in differentiation of chondrocytes and osteocytes. The gene NRG3 is a member of the neuregulin family, which encodes ligands for epidermal growth factor receptors ERBB3 and ERBB4. The epidermal growth factor receptor system has described roles in the regulation of proliferation and differentiation of osteoblast, chondrocyte and osteoclast cells. Identifying genetic risk factors for ALD has the potential to improve animal welfare and animal production in at-risk breeds. This study proposes TSPAN18 and NRG3 as targets for further research towards identifying genetic risk factors for ALD in Rambouillet sheep of the NW United States.

Keywords: sheep, 50K genotyping, GWAS

Determining Phenylalanine and Tyrosine Amino Acid Requirements in Growing Labrador Retrievers Using the Direct Amino Acid Oxidation Technique. Jordan T. Weil¹, Jessica L. Varney¹, Jason W. Fowler¹, Craig N. Coon¹, ¹Four Rivers Kennel, LLC

Abstract: Phenylalanine and tyrosine are important amino acids for synthesis of proteins, catecholamine neurotransmitters, and melanin in canines. Since phenylalanine (Phe) is converted to tyrosine (Tyr), this experiment used the direct amino acid oxidation (DAAO) technique to determine the phenylalanine requirement and phenylalanine plus tyrosine requirements for growing Labrador Retrievers. The Phe requirement was separated from Phe plus Tyr requirement by supplementing the test diets utilized for Phe requirements with 1.48% crystalline Tyr. A total of twelve dogs were used in two trials to determine the Phe and Phe + Tyr requirements in growing puppies (>14wk-1yr). Control diet was fed for two days, followed by a testing day where an experimental diet was fed, a tracer amino acid was supplied, and breath samples were collected. On test day, a priming dose of L-[1-¹³C]phenylalanine (Cambridge Isotope Laboratories, Inc.) based on the dog’s body weight was supplied, followed by enteral feeding of [1-¹³C]Phe every 30 minutes, spanning a four hour period. Respiration masks were placed on each subject every 30 minutes (Oxymax, Columbus Instruments), ¹³CO₂ collected, and enrichment determined by isotope ratio mass spectrometry (IRMS). Results for IRMS were converted to atom percent excess (APE) and analyzed using a segmented model (JMP® Pro 15). Results showed that Phe mean and population safe requirements were 1.29 +/- 0.26 g/1000 kcal, while the Phe + Tyr requirements were 1.95 +/- 0.65 g/1000 kcal. Knowledge gathered through these studies is invaluable as both the Phe and Phe plus Tyr dietary requirements for growing Labrador Retriever puppies were determined.

Keywords: dog amino acids, phenylalanine, tyrosine