Growth and Biochemistry

Intramuscular Injection of DNA to Identify DNA Elements that Control Porcine Alpha-skeletal Actin Transcription in Skeletal Muscle.

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Porcine alpha-skeletal actin promoter deletion constructs containing the chloramphenicol acetyltransferase (CAT) marker gene were used to determine the DNA elements controlling alpha-skeletal actin transcription in vivo. Plasmid DNA (50 (g) resuspended in saline solution was injected directly into mouse quadriceps muscle. Whole muscle extracts were analyzed for CAT activity 2, 4, 6, 12 and 18 d following injection. The CAT activity increased (P<.001) with day post-injection. As a further confirmation that skeletal muscle fibers incorporated and expressed injected DNA, CAT gene products were localized by immunohistochemistry. Deletion of a 5' distal regulatory element (5' DRE), bp -1929 to -550, shown previously to decrease (P<.001) promoter activity to basal levels in cultured myotubes, did not reduce promoter activity in skeletal muscle. Deletion of a proximal element, bp -550 to -388, did not reduce promoter activity in cultured myotubes, but did reduce (P<.05) promoter activity in skeletal muscle. Deletion of an intragenic regulatory element, (IRE), bp +55 to +237 relative to the transcription start site, increased (P<.001) promoter activity 5-fold. In addition, out of three regions that were shown previously to modulate activity of a heterologous promoter in cell culture experiments, only one element increased (P<.05) promoter activity in vivo. These results demonstrate that direct DNA injection methods may be utilized to identify DNA elements that regulate porcine alpha-skeletal actin transcription in skeletal muscle.

Key words: Porcine, Actin, Transcription

Balancing Amino Acids Using the Cornell Net Carbohydrate and Protein Systems (CNCPS) Model Increases Efficiency of Nitrogen Utilization by the Growing Holstein Steer.

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Feeding an undegraded intake protein (UIP) mixture formulated using the CNCPS to provide a "balanced" amino acid composition at the site of absorption in growing cattle was the focus of this experiment. The CNCPS was used to formulate a corn-based diet to meet rumen requirements for 250 kg Holstein steers and to formulate a UIP supplement from blood meal, hydrolyzed feather meal, fish meal and meat-and-bone meal. Six Holstein steers (276 kg BW) were fed a 90:10 concentrate-forage diet at hourly intervals. Treatments consisted of inclusion of the protein supplement at 0, 2.6, 5.2, 7.8 and 10.4% in the diet (10.8% to 15.8% CP). Each treatment lasted for 15 days; d1 to d7 diet adjustment, d8 to d14 N balance collection and d15 blood sampling. Daily DM intake (4.6 to 5.3 kg/d) was not altered, while N intake increased from 80.1 to 118.0 g/d (P<.001) across the treatments. Fecal N increased significantly by treatment (28.1 to 36.7 g/d; P<.01). Urinary N, while showing an increasing trend, 33.1 to 42.6 g/d (P<.22) was not significant. Nitrogen balance increased from 18.8 to 42.7 g/d (P<.04) and plasma urea N concentrations were not different (4.4 to 5.4 mg/dL). Results show that feeding this UIP mixture increased N retention by 127% and efficiency of N use by 38%. We conclude that supplementing high-grain diets fed to growing cattle should contain up to 10% of this UIP mixture to optimize rate and efficiency of protein gain.

Key Words: Cattle, Amino acids, Growth.