Relationships Between Prolactin Promoter Polymorphisms and Angus Calf Temperament Scores and Fecal Egg counts

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Introduction

The Southern region of the United States provides an ideal setting for internal parasites. This can result in an economic loss of $25 to $200/animal marketed, which totals to $30 million annually (Grandin, 1995). It has been shown that cattle with excitable temperament ratings produce higher incidence of dark cutting carcasses when compared to cattle with calm temperament. Temperament can be changed through genetic selection (Grandin, 1997). Over-selection can be detrimental to some economically important traits, such as mothering ability.

A positive correlation has been established between prolactin concentrations and fecal egg counts (Diaz-Torga et al., 2001). The use of genetic markers could be useful in selection. The objective of this study is to determine the relationships between single nucleotide polymorphisms (SNP) and calf temperament scores and fecal egg counts of internal parasites. Calves were chuted scored, weighed, measured, and fecal samples taken. The cow herd was maintained on endophyte infected fescue with recommended methods of dilution utilized. At weaning (d 0) each calf received fenbendazole at the rate of 10 mg/kg of body weight. Fecal samples were obtained at day 21 to determine the efficacy of fenbendazole. Subsequent fecal samples were taken at d 66, 111, 156, 201, and 246. The chute scores were determined on a scale of 1 to 5, using a modified version of that developed by Grandin et al. (1994) at d 0, 21, 66, 111, 156, 201, and 246. Nematode eggs per gram (EPG) were determined by homogenizing 1 gram of feces in saturated MgSO4, which was placed into a 15 µl centrifuge tube, filled to form a slight emiscus, capped with a 22 mm2 cover slip and centrifuged for 3 minutes. The cover slip was removed and placed on slide. All "strongyles" and Nematodirus eggs were counted, and the EPG's calculated. Fecal egg counts were normalized with a log 10(x+1) transformation. Genomic DNA was prepared from white blood cells. Calves were haplotyped using our previously published primers for the bovine prolactin promoter. Haplotypes were homozygous cytosine (CC; n = 3), heterozygous (CT; n = 25), and homozygous thymine (TT; n = 12). Data for analysis were BW, hip height, chute score and fecal egg counts determined at d 0, 21, 66, 111, 156, 201, and 246. Prolactin haplotype was related (P < 0.05) to strongyle egg counts at weaning (355 vs 149 and 167 eggs per gram; respectively for CC, CT, and TT). Prolactin haplotype was not related to other traits at weaning; however, at d 156, chute score and strongyle egg counts were related to haplotype. The CC calves were calmer (P < 0.10) than others (0.66 vs 1.4 and 1.8 chute score). In addition, CC calves had higher (P < 0.05) strongyle egg counts at d 156 when compared with other calves (34 vs 13 and 14 eggs per gram). These preliminary results suggest that susceptibility to natural infection with internal parasites may be associated with elements of the prolactin gene.

Experimental Procedure

Purebred Angus calves (n = 40) were used in this study. All calves were spring born in 2006 and weaned in the fall of 2006. Both sexes were included, and all calves were registered with the American Angus Association. No growth implants were used. Calves received no creep feed. The sires were selected with a balanced approach to EPDs. Traits of parasite resistance/susceptibility and temperament were not considered in sire selection. At weaning calves were chuted scored, weighed, measured, and fecal samples taken. The cow herd was maintained on endophyte infected fescue with recommended methods of dilution utilized. At weaning (d 0) each calf received fenbendazole at the rate of 10 mg/kg of body weight. Fecal samples were obtained at day 21 to determine the efficacy of fenbendazole. Subsequent fecal samples were taken at d 66, 111, 156, 201, and 246. The chute scores were determined on a scale of 1 to 5, using a modified version of that developed by Grandin et al. (1994) at d 0, 21, 66, 111, 156, 201, and 246. Nematode eggs per gram (EPG) were determined by homogenizing 1 gram of feces in saturated MgSO4, which was placed into a 15 µl centrifuge tube, filled to form a slight emiscus, capped with a 22 mm2 cover slip and centrifuged for 3 minutes. The cover slip was removed and placed on slide. All "strongyles" and Nematodirus eggs were counted, and the EPG's calculated. Fecal egg counts were normalized with a log 10(x+1) transformation. Genomic DNA was prepared from white blood cells. Calves were haplotyped using our previously published primers for the bovine prolactin promoter. Haplotypes were homozygous cytosine (CC; n = 3), heterozygous (CT; n = 25), and homozygous thymine (TT; n = 12). Data for analysis were BW, hip height, chute score and fecal egg counts determined at d 0, 21, 66, 111, 156, 201, and 246. Prolactin haplotype was related (P < 0.05) to strongyle egg counts at weaning (355 vs 149 and 167 eggs per gram; respectively for CC, CT, and TT). Prolactin haplotype was not related to other traits at weaning; however, at d 156, chute score and strongyle egg counts were related to haplotype. The CC calves were calmer (P < 0.10) than others (0.66 vs 1.4 and 1.8 chute score). In addition, CC calves had higher (P < 0.05) strongyle egg counts at d 156 when compared with other calves (34 vs 13 and 14 eggs per gram). These preliminary results suggest that susceptibility to natural infection with internal parasites may be associated with elements of the prolactin gene.

Results and Discussion

Strongyle egg count by haplotype for Angus calves are presented in Fig. 1. The CC haplotype had greater (P < 0.05) fecal egg counts when compared to CT and TT haplotypes. Chute score by prolactin haplotype for Angus calves at weaning are presented in Fig. 2. The CC calves were calmer (P < 0.10) compared to calves of the CT or TT haplotypes (0.66 vs. 1.4 and 1.8 chute score, respectively). Strongyle egg count by prolactin haplotype for Angus calves at weaning +156 d is presented in Fig. 3. The CC calves had higher Strongyle egg counts.

Story in Brief

Spring born purebred Angus calves (n = 40) were used to determine the relationships between single nucleotide polymorphisms (SNP) and calf temperament scores and fecal egg counts of internal parasites. Calves were chuted scored, weighed, and fecal sampled at weaning. All calves were treated with anthelmintic (fenbendazole, 10 mg/kg BW) at weaning. Chute scores were estimated as 1 extremely docile to 5 very agitated and frenzied behavior. Genomic DNA was prepared from white blood cells and calves haplotyped using our previously published primers for the bovine prolactin promoter. Haplotypes were homozygous cytosine (CC; n = 3), heterozygous (CT; n = 25), and homozygous thymine (TT; n = 12). Data included in the analyses were BW, hip height, chute score, and fecal egg counts determined at d 0, 21, 66, 111, 156, 201, and 246. Prolactin haplotype was related (P < 0.05) to strongyle egg counts at weaning (355 vs 149 and 167 eggs per gram; respectively for CC, CT, and TT). Prolactin haplotype was not related to other traits at weaning; however, at d 156, chute score and strongyle egg counts were related to haplotype. The CC calves were calmer (P < 0.10) than others (0.66 vs 1.4 and 1.8 chute score). In addition, CC calves had higher (P < 0.05) strongyle egg counts at d 156 when compared with other calves (34 vs 13 and 14 eggs per gram). These preliminary results suggest that susceptibility to natural infection with internal parasites may be associated with elements of the prolactin gene.
at d 156 when compared to calves of the CT or TT haplotype (34 vs. 13, and 14 eggs per gram, respectively). Further studies with a larger number of animals are needed to confirm these findings; however, these preliminary results suggest that susceptibility to natural infection with internal parasites may be associated with elements of the prolactin gene.

Literature Cited


Fig. 1. Strongyle egg counts for each haplotype for Angus calves at weaning. ab Bars with no letter in common differ ($P < 0.01$).

Fig. 2. Chute score by prolactin haplotype for Angus calves at weaning +156 days. ab Bars with no letters in common differ ($P < 0.10$).
Fig. 3. Strongyle egg count (EPG) for each prolactin haplotype (CC, CT, or TT) for Angus calves at weaning +156 days. 
ab Bars with no letters in common differ (P < 0.05).