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ORIGINAL ARTICLE

A Study of Combined Genotype Effects of SHCBP1 on Wool Quality Traits in Chinese Merino

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Abstract

SHCBP1 (Shc SH2-domain binding protein 1) is a member of the Src and collagen homolog (Shc) protein family and is closely associated with multiple signaling pathways that play important roles during hair follicle induction, morphogenesis, and cycling. The purpose of this study was to investigate *SHCBP1* gene expression, polymorphisms, and the association between *SHCBP1* and wool quality traits in Chinese Merino sheep. The *SHCBP1* gene was shown, by qPCR, to be ubiquitously expressed in sheep tissues and differentially expressed in the adult skin of Chinese Merino and Suffolk sheep. Four SNPs (termed SHCBP1SNPs 1–4) were identified by Sanger sequencing and were located in exon 2, intron 9, intron 12, and exon 13 of the sheep *SHCBP1* gene, respectively. SHCBP1SNPs 3 and 4 (rs411176240 and rs160910635) were significantly associated with wool crimp ($P<0.05$). The combined polymorphism (SHCBP1SNP3-SHCBP1SNP4) was significantly associated with wool crimp ($P<0.05$). Bioinformatics analysis showed that the SNPs associated with wool crimp (SHCBP1SNPs 3 and 4) might affect the pre-mRNA splicing by creating binding sites for serine–arginine-rich proteins and that SHCBP1SNP4 might alter the SHCBP1 mRNA and protein secondary structure. Our results suggest that SHCBP1 influences wool crimp and SHCBP1SNPs 3 and 4 might be useful markers for marker-assisted selection and sheep breeding.

Keywords SHCBP1 · Tissue expression · SNP · Wool crimp

Introduction

The Src homolog and collagen homolog (Shc) proteins are adapter proteins associated with mammal cell surface receptors and contain three different proteins: Shc A, Shc B, and Shc C (Wills and Jones 2012). Shc A is widely expressed in mammalian cells,

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