

Article

Variation in Ovine *DGAT1* and Its Association with Carcass Muscle Traits in Southdown Sheep

Rong Dai ¹, Huitong Zhou ², Qian Fang ², Ping Zhou ¹, Yang Yang ¹, Shuang Jiang ² and Jonathan G. H. Hickford ^{2,*}

¹ Xingjiang Academy of Agricultural and Reclamation Science/State Key Laboratory of Sheep Genetic Improvement and Healthy Production, Shihezi 832000, China

² Gene-Marker Laboratory, Department of Agricultural Sciences, Lincoln University, Lincoln 7647, New Zealand

* Correspondence: jonathan.hickford@lincoln.ac.nz

Abstract: Diacylglycerol O-acyltransferase 1 (DGAT1) is a microsomal enzyme that plays a key role in the synthesis of triglycerides. Its gene (*DGAT1*) is regarded as a candidate gene for variation in milk and meat traits in cattle. The objective of this study was to use a PCR single-strand conformation polymorphism approach to explore sequence variation in two regions of ovine *DGAT1* and to assess its effect on meat traits in New Zealand Southdown sheep. Three variant nucleotide sequences were identified in each region, with two single nucleotide polymorphisms (SNPs) and one nucleotide deletion being detected in intron 1 and two SNPs being found in exon 17. The effect of the exon 17 variation was not investigated due to one variant being predominant and the other two variants occurring at low frequencies. In intron 1, one variant (B_1) was found to be associated with increase loin meat yield, suggesting that this may have value as a gene marker for improving meat traits.

Keywords: diacylglycerol O-acyltransferase 1 gene; polymorphism; PCR-SSCP; lamb; loin meat yield



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1. Introduction

Fat is an unpopular constituent of meat for many consumers, as it is considered unhealthy and high intakes of saturated fat are reported to be associated with increased heart disease risks [1]. However, fat and fatty acids affect various aspects of meat quality and palatability, and they play an important role in the nutritional and market value of meat [2]. Genes regulating lipid metabolism and deposition have therefore been a research focus for the genetic improvement of livestock.

The diacylglycerol O-acyltransferase 1 (DGAT1) gene (*DGAT1*) is one of the most extensively investigated lipid metabolism genes in livestock. It encodes a microsomal enzyme that catalyzes the terminal and only committed step in triacylglycerol synthesis; thus, it has a key role in the metabolism of cellular glycerolipids [3]. Considerable effort has centered on understanding the effects of *DGAT1* variation on livestock production, with the research focusing on an exon 8 polymorphism (commonly called K232A). Currently, the most notable effect of this polymorphism is on milk production, and for a variety of cattle breeds from different countries, including the Netherlands [4,5], Germany [6,7], France [8], Poland [9], Israel [10], Sweden [11], China [12] and New Zealand [4,13].

The effect of the bovine *DGAT1* K232A polymorphism on meat and carcass production has also been widely investigated, but the results obtained lack consistency. Li et al. [14] reported that K232A affected intramuscular fat content (IMF) and marbling in five beef breeds. In Germany, Thaller et al. [6] described a similar effect on IMF, but this effect was only detected in Holstein and not in Charolais cattle. In contrast, Pannier et al. [15] and Aviles et al. [16] reported a lack of association between K232A and IMF in Irish crossbred *Bos taurus* cattle and Spanish crossbred cattle, respectively. With the Spanish crossbred