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Genomic Copy Number Variation of the Chkb Gene Alters Gene Expression and Affects Growth Traits of Chinese Domestic Yak (*Bos grunniens*) Breeds

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Abstract

Copy number variation (CNV) influences the mRNA transcription levels and phenotypic traits through gene dosage, position effects, alteration of downstream pathways, and modulation of the structure and position of chromosomes. A previous study using the read depth approach to genome resequencing analysis revealed CNVs of the choline kinase beta (CHKB) gene in the copy number variable regions (CNVRs) of yak breeds may influence muscle development and therefore the phenotypic traits of yak breeds. Further work is required to attain a more complete understanding and validate the importance of the detected CNVR of the CHKB gene found in yak breeds, because there is no association studies of the CHKB gene with yak growth traits have been reported. The goal of this study was to determine the distribution of CHKB copy numbers in five Chinese domestic yak breeds and evaluate their impact on gene expression and growth traits. The data were analysed using real-time quantitative PCR (qPCR). In this study, the normal CNV of the CHKB gene was found to be significantly ($p < 0.05$) associated with greater chest girth and body weight for three age groups of Datong yaks. Our results indicated that the copy number of the CHKB gene is negatively correlated with the mRNA expression level. From this result, we conclude that CNVs of the CHKB gene could be novel markers for growth traits of Chinese domestic yak breeds and might therefore provide a novel opportunity to utilise data on CNVs in designing molecular markers for the selection of animal breeding programs for larger populations of various yaks.

Keywords: CHKB gene, copy number variation, expression analysis, growth traits, yaks