



# Single nucleotide polymorphisms in the growth hormone and insulin-like growth factor-1 genes are associated with milk production, body condition score and fertility traits in dairy cows

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**ABSTRACT.** The somatotrophic axis (GH-IGF) is a key regulator of animal growth and development, affecting performance traits that include milk production, growth rate, body composition, and fertility. The aim of this study was to quantify the association of previously identified SNPs in bovine growth hormone (*GH1*) and insulin-like growth factor 1 (*IGF-1*) genes with direct performance trait measurements of lactation and fertility in Holstein-Friesian lactating dairy cows. Sixteen SNPs in both *IGF-1* and *GH1* were genotyped across 610 cows and association analyses were carried out with traits of economic importance including calving interval, pregnancy rate

to first service and 305-day milk production, using animal linear mixed models accounting for additive genetic effects. Two *IGF-1* SNPs, *IGF1i1* and *IGF1i2*, were significantly associated with body condition score at calving, while a single *IGF-1* SNP, *IGF1i3*, was significantly associated with milk production, including milk yield (means  $\pm$  SEM;  $751.3 \pm 262.0$  kg), fat yield ( $21.3 \pm 10.2$  kg) and protein yield ( $16.5 \pm 8.0$  kg) per lactation. Only one *GHI* SNP, *GH33*, was significantly associated with milk protein yield in the second lactation (allele substitution effect of  $9.8 \pm 5.0$  kg). Several *GHI* SNPs were significantly associated with fertility, including *GH32*, *GH35* and *GH38* with calving to third parity ( $22.4 \pm 11.3$  days) (*GH32* and *GH38* only), pregnancy rate to first service (0.1%) and overall pregnancy rate (0.05%). The results of this study demonstrate the effects of variants of the somatotrophic axis on milk production and fertility traits in commercial dairy cattle.

**Key words:** Single nucleotide polymorphism; Fertility; *IGF-1*; Growth hormone; Dairy cattle