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Effects of polymorphisms in the bovine growth differentiation factor 9 gene on sperm quality in Holstein bulls

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ABSTRACT. Members of the transforming growth factor-β (TGFβ) superfamily are critical regulators of germ cell development that act as extracellular ligands of the signal transduction pathways regulating proliferation, differentiation, apoptosis, and other aspects of cell behavior. Growth differentiation factor 9 (GDF9) is a member of the TGFβ superfamily that plays a critical role in ovarian follicular development and ovulation rate in females; however, its role in the testis has not been well elucidated. Therefore, in this study we investigated the effects of *GDF9* mutations on the quality of fresh and frozen semen of Holstein bulls. Two reported single nucleotide polymorphisms of *GDF9*, A485TA and A625C, were analyzed in 129 Holstein bulls. Analysis of variance revealed that the A485T polymorphism had significant effects on the acrosome integrity rate ($P < 0.05$), whereas the A625T polymorphism was significantly associated with sperm concentration ($P < 0.05$). In addition, a significant additive effect on sperm concentration was detected for the A485T polymorphism ($P < 0.05$), whereas the polymorphisms

A485TA and A625C had significant dominant effects on acrosome integrity rate and sperm motility in frozen semen, respectively ($P < 0.05$). This study is the first to show a significant association of *GDF9* with sperm quality traits, and the results implied that GDF9 is involved in the initiation or maintenance of spermatogenesis; however, further verification is needed.

Key words: Holstein bulls; Polymorphism; Sperm quality; Growth differentiation factor 9

