Genetic Variants Associated with Behavioural Response During Milking in Cows

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Abstract

Cattle breeding has traditionally focused on improving production traits; however, recent interest in positive animal welfare has shifted attention toward selecting for more robust animals that balance productivity with health and well-being. The aim of the current study was to assess whether behavioural responses during milking in dual-purpose cattle are associated with genetic markers, previously linked to temperament traits in dairy and beef breeds. We focused on 185 lactating cows belonging to the Simmental strain (Romanian Spotted, national name), which were evaluated for their milking behaviour. Genotyping was performed using an 88-SNP panel selected based on prior associations with dairy and beef cattle temperament. The selected SNPs belong to 24 genes associated with 'milking temperament': GAP43 (Growth-Associated Protein 43), KCNJ3 (Potassium Inwardly Rectifying Channel Subfamily J Member 3), CD2 (Cluster of Differentiation 2), IGSF3 (Immunoglobulin Superfamily Member 3), NXNL2 (Nucleoredoxin Like 2), GRIN3A (Glutamate Ionotropic Receptor NMDA Type Subunit 3A), TBC1D32 (TBC1 Domain Family Member 32), RARS2 (Arginyl-tRNA Synthetase 2, Mitochondrial), RPS6KA2 (Ribosomal Protein S6 Kinase A2), NEO1 (Neogenin 1), HCN4 (Hyperpolarization-Activated Cyclic Nucleotide-Gated Channel 4), KCTD3 (Potassium Channel Tetramerization Domain Containing 3), USH2A (Usherin), HSPB8 (Heat Shock Protein Family B Member 8), SRRM4 (Serine/Arginine Repetitive Matrix 4), OTUD7A (OTU Deubiquitinase 7A), ADAMTS7 (A Disintegrin And Metalloproteinase With Thrombospondin Motifs 7), TBC1D2B (TBC1 Domain Family Member 2B), EEFSEC (Eukaryotic Elongation Factor, Selenocysteine-tRNA-Specific), RUVBL1 (RuvB Like AAA ATPase 1), KBTBD12 (Kelch Repeat and BTBDomain Containing 12), ZMAT4 (Zinc Finger, Matrin-Type 4); 'flight speed': BTC(Betacellulin); 'temperament and habituation': ADCY2 (Adenylate Cyclase 2). Genes wereincluded based on their previously reported associations with behavioural traits in cattle andtheir involvement in neurobiological processes such as sensory perception, synaptic functionand stress response regulation.We identified five SNPs that were significantly associated withmilking reactivity in the Romanian Spotted breed, located in genes previously linked to neuraldevelopment, stress response and behavioural regulation (USH2A, ADAMTS7, TBC1D2Band ZMAT4). Our findings suggest that milking behaviour in dual-purpose Simmental cattle is influenced by genetics, supporting the potential for including behavioural traits in future selection strategies. This study contributes to a better understanding of the genetic mechanisms underlying stress-related behaviours in dual-purpose cattle breeds.

Keywords
animal welfare; genetic markers; milking behaviour; Romanian Spotted

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