

Association of SNP and STR polymorphisms of insulin-like growth factor 2 receptor (*Igf2r*) gene with milk traits in Holstein-Friesian cows

Marta Dux¹, Magdalena Muranowicz¹, Eulalia Siadkowska¹, Dagmara Robakowska-Hyzorek¹, Krzysztof Flisikowski², Emilia Bagnicka¹, and Lech Zwierzchowski^{1*}

¹Institute of Genetics and Animal Breeding, Polish Academy of Sciences, 05-552 Jastrzębiec, 36a Postępu str., Poland.

²Chair of Livestock Biotechnology, Technical University of Munich, Liesel-Beckmann str.1 D-85354 Freising, Germany

Short title: **Association of *Igf2r* polymorphism with dairy traits in cattle**

*Correspondence: Lech Zwierzchowski
Department of Molecular Biology
Institute of Genetics and Animal Breeding
Polish Academy of Sciences
Jastrzębiec, Postępu 36a
05-552 Magdalenka
Poland
Phone +48-22-736 7057
E-mail: l.zwierzchowski@ighz.pl

Summary

The experiments reported in this research paper aimed to show if the polymorphism in the *Igf2r* gene can be used as a genetic marker for milk production traits in cattle. Insulin-like growth factor receptor 2 (IGHF2R) is a multifunctional, transmembrane glycoprotein receptor to many ligands, including IGF2. It functions to regulate the availability of biologically active IGF2. Because of this physiological function, *Igf2r* gene pretends to be a genetic marker for milk or meat production in farm animals. Six novel polymorphisms were detected in the bovine *Igf2r* gene. Two variable TG-repeat polymorphisms were found in intron 23 and in 3'UTR coding region, and four SNPs – g.102832G>A and g.102903G>A in 3'UTR, g.72479G>A in exon 24 and g.100475C>T in intron 43. The TG microsatellite sequence polymorphism in intron 23 (g.72389 (TG)15-67) and the g.72479 G>A transition in exon 24 were analyzed to estimate correlation with dairy production traits in HF cows. Association was found of the G/A genotype with milk and protein yield, lactose content and SCC (all significant at $p \leq 0.01$). The GG and GA genotypes exceeded AA in milk and protein yield and in SCC, while AA genotype was favorable for lactose content. Also the microsatellite polymorphism in intron 23 showed statistically significant ($p \leq 0.05 \sim p \leq 0.01$) associations with milk traits; the analysis allowed selecting of STR genotypes with high values for milk (29/22, 28/29, 28/22, 28/28), protein (28/22, 28/23), fat (28/22, 28/23) yield, lactose content (25/20), and for low SSC (29/33, 28/28). We suggest that the *Igf2r* gene polymorphisms could have been potentially used as genetic markers for dairy production traits in cattle.