

DEPARTMENT OF GENETICS AND BREEDING OF FARM ANIMALS
Molecular Genetics

Our goal is to investigate the effect of genetic variability on the efficiency and functional traits of farm animals and to use the obtained knowledge for achievement of the reasonable balance between a high level of performance and fitness.

OVERVIEW OF ACTIVITIES

We focus on nucleotide polymorphisms of the selected genetic markers in farm animals. The original experimental data are obtained first of all for candidate genes and highly variable microsatellite regions. The expert team is also engaged in the collection and subsequent recording of the breeding data for research purposes and the evaluation of gene effects. The aim is to estimate the influence of genes not only on the traits of performance, fertility, health and exterior, but also on the quality of food. We also investigate the genetic background of the native breeds and genetic resources and their comparison with the intensively bred commercial populations in the Czech Republic. Regarding basic research, we identify new gene variants by DNA sequencing, including NGS and use the chip technology, and study the regulation of activity of the individual genes as well. Except this we develop and patent new laboratory procedures and genotyping methods. For farmers we also offer the genotyping service of the casein complex in cattle, sheep and goats, booroola gene in sheep, and coat colour genes in horses.

MEMBERS OF THE TEAM

Scientists and experts

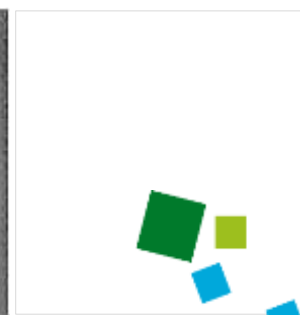
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KEY WORDS

association, DNA polymorphism, functional traits, genetic diversity, genetic marker, genotyping, milk quality





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MAIN THEMES & PROJECTS

- The use of DNA polymorphism and investigation of the genes influencing performance and health are the key research topics. We performed the molecular analysis of the gene variants such as myogenic transcription factors, leptin, lactoferrin, toll like receptors, the major histocompatibility system, fatty acid metabolism genes and many others. We estimate their associations with growth, milk performance, reproduction, longevity and health mainly in Czech Fleckvieh and also in dairy sheep breeds and Brown and White shorthair goats.
- The next important theme is genetic variability and biodiversity at Old Kladruby and hucul horses, Red cattle, Czech gold brindled hen, Czech goose and rabbit breeds included in the National programme of the genetic resources conservation
- Projects of the National agency of agriculture research: Influence of genetic polymorphism of lipogenic enzymes on milk fat composition and fatty acid content in milk of small ruminants (goats and sheep). (Z. Sztankóová). Investigation of factors influencing the profitability, quality and safety of milk and dairy products of small ruminant breeds in the Czech Republic. (J. Rychtářová). Occurrence of genetic factors for infection resistance in selected breeds of dairy cattle (K. Novák). Addressing the problem of the occurrence of bacterial, protozoan and viral zoonotic agents in small ruminant breeds. (J. Kyselová). New procedures for the preservation of endangered populations of farm animals. (J. Rychtářová).
- Projects of the Technological agency: Determination of the genetic markers of bovine resistance and Routine genotyping of the coat colour genes in horses. (K. Novák, J. Kyselová)

KEY PUBLICATIONS

HOFMANNOVA, M., RYCHTAROVA, J., SZTANKOOVA, Z., MILERSKI, M., VOSTRY, L. & SVITAKOVA, A. (2018) Association between polymorphism of ABCG2 gene and somatic cell count in Czech dairy sheep breeds. *Medycyna Weterynaryjna-Veterinary Medicine-Science and Practice* 74: 489-492

JECMINKOVA, K., MULLER, U., KYSELOVA, J., SZTANKOOVA, Z., ZAVADILOVA, L., STIPKOVA, M. & MAJZLIK, I. (2018) Association of leptin, toll-like receptor 4, and chemokine receptor of interleukin 8 C-X-C motif single nucleotide polymorphisms with fertility traits in Czech Fleckvieh cattle. *Asian-Australas J Anim Sci.* 31, 11:1721-1728

JOCHOVA, M., NOVAK, K., KOTT, T., VOLEK, Z., MAJZLIK, I. & TUMOVA, E. (2017) Genetic characterization of Czech local rabbit breeds using microsatellite analysis. *Livestock Science* 201: 41-49

NOVÁK, K. (2014) Functional polymorphisms in Toll-like receptor genes for innate immunity in farm animals. *Veterinary Immunology and Immunopathology* 157: s. 1-11.

<http://dx.doi.org/10.1016/j.vetimm.2013.10.016>

NOVAK, K., PIKOUSOVA, J., CZERNEKOVA, V. & MATLOVA, V. (2017) Diversity of the TLR4 Immunity Receptor in Czech Native Cattle Breeds Revealed Using the Pacific Biosciences Sequencing Platform. *Animal Biotechnology* 28: 228-236

KYSELOVÁ, J., JEČMÍNKOVÁ, K., MATĚJÍČKOVÁ, J., HANUŠ, O., KOTT, T., ŠTÍPKOVÁ, M. & KREJČOVÁ, M. (2018) Physiochemical characteristics and fermentation ability of milk from Czech Fleckvieh cows are related to genetic polymorphisms of β -casein, κ -casein, and β -lactoglobulin. *Asian-Australas J Anim Sci.* Advanced on line publication doi.org/10.5713/ajas.17.0924

RYCHTÁŘOVÁ, J., SZTANKÓOVÁ, Z., KYSELOVÁ, J., ZINK, V., ŠTÍPKOVÁ, M., VACEK, M. & ŠTOLC, L. (2014) Effect of DGAT1, BTN1A1, OLR1, and STAT1 genes on milk production and reproduction traits in the Czech Fleckvieh breed *Czech Journal of Animal Science* 59: 45-53.

SZTANKÓOVÁ, Z., RYCHTÁŘOVÁ, J., KYSELOVÁ, J. & CZERNEKOVA, V. (2016) Simultaneous genotyping of 4 SNPs in promoter III of the ovine ACACA. *Small Ruminant Research* 138:25-30.

<http://dx.doi.org/10.1016/j.smallrumres.2016.03.027>

