

Biochemical and gene expression differences associated with higher fat deposition in Krškopolje pigs – comparison with lean crossbred pigs

Klavdija Poklukar¹, Marjeta Čandek Potokar¹, Nina Batorek Lukač¹,
Urška Tomažin¹, Martin Škrlep¹

¹Oddelek za živinorejo, Kmetijski inštitut Slovenije (KIS), Ljubljana,
Slovenia

Corresponding author: Martin Škrlep (martin.skrlep@kis.si)

In Slovenia, there is only one autochthonous local pig breed, the Krškopolje pig. The interest for this endangered breed is lately increasing. One of the important reasons for this is a better quality of meat and fat, which enables the production of high-quality products. Krškopolje pig is also well adapted to local feeding resources and extensive rearing systems. This breed has not yet been studied with regard to the mechanisms explaining much greater fat deposition compared to modern lean pigs. Therefore, the objective of the present study was to determine biochemical and gene expression differences associated with fat deposition. Six Krškopolje and six modern hybrid pigs (progeny of Landrace x Large White sows and Duroc boars) were reared in equal environmental conditions and were fed the same diet. At an average body weight of 165.6 ± 8.2 kg (mean \pm SE), the animals were slaughtered in a commercial abattoir according to standard slaughter procedures. Carcass traits were measured and intramuscular fat was determined in the *Longissimus dorsi* muscle. Fatty acid composition, the activity of lipogenic enzymes (malic enzyme, glucose-6-phosphate dehydrogenase, citrate cleavage enzyme), and expression of genes involved in lipid metabolism (using qPCR) were determined in backfat samples taken at the level of the last rib. As expected, Krškopolje pigs exhibited higher backfat thicknesses at different anatomical locations (i.e. last rib, at the withers, and above the *Gluteus medius* muscle; $P < 0.001$), whereas the intramuscular fat content of the *Longissimus dorsi* muscle did not differ between groups ($P > 0.05$). Malic enzyme and glucose-6-phosphate dehydrogenase

activities were 2.59- and 1.98-fold lower, respectively, in the Krškopolje pigs than lean crossbred pigs ($P < 0.01$). However, no significant differences were found for the citrate cleavage enzyme ($P > 0.05$). Compared to the lean crossbred pigs, the backfat of Krškopolje pigs contained a higher content of monounsaturated (MUFA) and a lower content of polyunsaturated fatty acids ($P < 0.01$) while the content of saturated fatty acids did not differ ($P > 0.05$). Consistent with the higher MUFA content, overexpression of the stearoyl-CoA desaturase gene was also detected in Krškopolje pigs when compared to the lean crossbred pigs ($P < 0.01$). In addition, higher expression of genes involved in lipogenesis (i.e. *ACACA*, *FASN*, *PPAR γ*) or energy homeostasis (i.e. *LEP*) was observed in Krškopolje pigs than in modern crossbred pigs ($P < 0.05$). In conclusion, Krškopolje pigs exhibited higher fat deposition associated with higher MUFA content, and higher expression of genes involved in lipogenesis than in lean crossbred pigs. Controversially, the activity of lipogenic enzymes was still found lower in Krškopolje pigs.

Keywords: local pig breed, lipid deposition, subcutaneous adipose tissue, fatty acid composition, lipogenic enzyme activity, gene expression

Acknowledgement

The authors acknowledge core financing from the Slovenian Research Agency (grant numbers P4-0133, J4-3094 and PhD scholarship for K.P.).