

Underlying mechanisms of lipid deposition in local and modern pig breeds

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While intensive selection resulted in accelerated growth rate and better lean meat deposition in modern pig breeds, local breeds still retain lower performance capabilities. On the other hand, they exert better adaptation to specific local environments, including local feed sources, environmental food shortages and seasonal food availability. Along with lower growth potential, they have the ability of higher fat deposition, which reflects their particular lipid metabolism properties. Although genetic, biochemical and physiological mechanisms, that result in the differences between local and modern breeds are still not fully explicated, many conclusions can be drawn, based on available research. Besides higher fat accumulation, the lipids in local breeds contain more saturated and in particular more monounsaturated fatty acids (mostly oleic acid). Specific fatty acid composition may be associated to higher activity of lipogenic enzymes, higher and more persistent desaturation ability and lower potential for lipolysis in either subcutaneous or intramuscular fat depot. Higher adiposity of local breeds is reflected on histological level, as better adipocyte hyperplastic and hypertrophic abilities are leading to higher adipocyte size. In addition, hormone-related specificities were also indicated in some local breeds, including leptin resistance. As to the transcriptomic and proteomic studies, several gene groups are uncovered that differ between the breed types. In subcutaneous fat tissue, these include downregulation of genes involved in mitochondrial energy metabolism and development of the extracellular matrix and upregulation of genes and proteins associated to fatty acid transportation, lipogenesis,

lipid desaturation, insulin signalling/response and immune response in local compared to modern pig breeds. In intramuscular fat, upregulation of additional genes related to adipogenesis, fatty acid mobilization and lipolysis were indicated in local breeds. The research aiming at detecting selection signatures characteristic to the European local breeds (leading to adaptation to specific local environments) pointed out several interesting results. These include genes related to adipocyte lipid degradation, immune response and taste receptors in addition to several other genes of lipid metabolism. A recent study performed a selection scan with link to phenotype and recognized several genomic regions, which could affect fatty phenotype in European local pig breeds, with individual candidate genes involved in energy balance, adipose tissue development and inhibition of protein synthesis in response to stress.

Keywords: pig, local breeds, fat depots, lipogenic enzymes, fat tissue properties, metabolism, gene expression

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