Association study between SNPs in cathepsin genes and production traits in Italian Duroc pigs

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ABSTRACT

Cathepsins are lysosomal proteinases with a broad spectrum of functions that ensure turnover of metabolites and cell and tissue structures via bulk protein degradation. They are involved in cancer progression and metastasis and are considered to be cancer markers. They also possess highly specific and directed proteolitic activities, participating in antigen processing and presentation, with effects on immune response, and in hormone and proenzyme processing with effects on biochemical pathway regulation and activation. In pigs, high cathepsin activities have been associated with defects of dry cured hams. We recently identified DNA markers in several porcine cathepsin genes associated with meat production and carcass traits in Italian Large White pigs. Here, we selected some of these cathepsin genes (cathepsin D, *CTSD*; cathepsin F, *CTSF*; cathepsin Z, *CTSZ*) and investigated additional other cathepsins (cathepsin L, *CTSL*; cathepsin S, *CTSS*) to analyse DNA markers in association studies with meat and production traits in Italian Duroc pigs. New polymorphisms in the *CTSL* and *CTSS* genes were identified by *in silico* mining of porcine expressed sequence tags. Radiation hybrid mapping was obtained for the *CTSD* gene, confirming and refining its position on porcine chromosome (SSC) 2, and for the *CTSS* gene that was placed on SSC4, confirming comparative mapping data. The *CTSD*, *CTSF*, *CTSL*, *CTSS*, and *CTSZ* gene markers were genotyped in 300-310 Italian Duroc sib-tested animals for which estimated breeding values for average daily gain (ADG), back-fat thickness (BFT), lean cuts (LC), feed:gain ratio (FGR), and visible intermuscular fat were calculated. Significant associations were observed for *CTSD* ($P<0.0001$; ADG, BFT, LC, FGR) and *CTSL* ($P<0.05$; LC). These results confirm the strong effects of the *CTSD* marker we already reported in Italian Large White pigs.