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Muscle Fiber Type Distribution of Longissimus Dorsi Muscle in High and Low Performing Pigs and in Different Pig Breeds

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Abstract

Muscle fiber types, characterised by the content of different myosin heavy chain (MYH) isoforms, are responsible for variation of growth performance and meat quality traits in farm animals. The first objective of this study was to compare the muscle fiber type composition based on relative abundance of transcripts of MYH isoforms in animals showing high and low muscularity within breed. For this experiment, six discordant sibpairs representing extremes for the complex trait body conformation were selected from a F2 resource population DUMI, which was created by reciprocal crossbreeding of Duroc and Berlin Miniature pigs, a cross of Vietnamese Pot Belly Pigs, Saddle Back Pigs and German Landrace. Secondly, we aimed to compare the expression profile of MYH isoforms among different breeds of Duroc and Pietrain from Germany and Mongcai from Vietnam, which have been known to extremely differ in muscle growth and meat quality. Results from real-time RT-PCR quantification of MYH isoform I, IIa, IIx and IIb showed that the relative expression of MYH IIb (fast-glycolytic) was significantly higher ($p < 0.05$) in pigs with large muscle area in DUMI (60.5 vs 47.5 %). Conversely, the content of MYH I/slow (slow-oxidative) fibers was statistically different ($p < 0.05$) with lower percentage in high performing animals (18.4 vs 33.5 %). Moreover, the comparison among breeds confirmed the trend of high MYH IIb transcript abundance going together with high muscularity. In Pietrain and Duroc, abundance of MYH IIb accounted for more than half of the MYH transcripts (65.4 % and 59.7 %) whereas Mongcai showed very low MYH IIb (11.4 %) but high type I, IIa and IIx RNA levels (24.1, 28.5 and 35.9 %, respectively). All together, the present results indicate that IIb fibers are the most prominent in pigs having large eye muscle area. (This project was supported by the Federal Ministry of Education and Research, BMBF grant VNB02/B06, Germany).

Keywords: Different pig breeds, muscle fiber, myosin heavy chain, realtime RT-PCR