

动物遗传学

西部地区主要猪种H-FABP基因多态性, IMF含量及不同基因型脂肪细胞脂滴量的关系

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收稿日期 2005-12-7 修回日期 2006-2-9 网络版发布日期 2006-6-13 接受日期

摘要

H-FABP是FABP家族成员之一, 在长链脂肪酸的吸收和代谢平衡中发挥关键作用, 但它对猪IMF含量的影响还知之甚少, 对中国西部地区的猪种更是如此。文章利用PCR-RFLP (Hinf I、HaeIII和Msp I 3种限制性内切酶) 分子标记技术, 检测了杜洛克猪、长白猪、大白猪、内江猪、荣昌猪、汉江黑猪、汉中白猪、八眉猪和野猪共计265头猪H-FABP基因5'-上游区和第二内含子区的遗传变异, 利用最小二乘模型分析了H-FABP基因对猪肌内脂肪含量的遗传效应, 并运用猪脂肪细胞培养, 油红O染色和TG测定等技术检测了H-FABP基因不同基因型脂肪细胞内脂滴的形态和沉积的量。结果表明: (1) 在Hinf I-RFLP位点上, 上述品种和野猪均存在多态性, 其中大白猪、八眉猪、汉江黑猪、汉中白猪和野猪表现为低度多态, 杜洛克、长白猪、内江猪和荣昌猪为中度多态; 除汉江黑猪 (P<0.05) 和野猪 (P<0.01) 外, 其他猪种基因频率和基因型频率都处于Hardy-Weinberg平衡状态 (P>0.05); 而在HaeIII-RFLP和Msp I-RFLP位点上, 仅内江猪、荣昌猪、汉江黑猪和八眉猪为单态; (2) 9种基因型对肌内脂肪 (IMF) 含量的影响, HH>Hh>hh, DD<Dd<dd, AA<Aa<aa, 遗传效应值分别为:3.89, 3.42, 3.17, 2.27, 2.49, 2.91, 2.28, 2.70, 2.95, H-FABP基因可显著地提高IMF含量 (P<0.05); (3) aaddHH型的脂肪细胞脂滴的形态, 密度和含量与其他基因型细胞差异显著 (P<0.05)。结果提示: 可通过提高“aaddHH”基因型的频率来增加IMF含量, 达到改善猪肉质的目的。

关键词

猪种; 心脏脂肪酸结合蛋白基因; 多态性; 肌内脂肪含量; 脂滴; 脂肪细胞

分类号

Relationship Among H-FABP Gene Polymorphism, Intramuscular Fat Content, and Adipocyte Lipid Droplet Content in Main Pig Breeds with Different Genotypes in Western China

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Abstract

<P>H-FABP(Heart fatty acid-binding protein), a member of FABP family, plays an essential role in long-chain fatty acid uptake and metabolic homeostasis. Its role in pig intramuscular fat content remains poorly understood, especially in local pig breeds in western China. In this study, the genetic variations of 5'-upstream region and the second intron in porcine H-FABP gene were investigated by PCR-RFLP in 256 pigs including Duroc, Large White, Landrace, Neijiang, Rongchang, Bamei pig,

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Hanjiang Black, Hanzhong White, and the wild ones. The effect of H-FABP gene on the IMF content was analyzed by the least square method. Lipid droplet morphology and content in adipocytes cultured from pigs with different H-FABP genotypes, were studied by oil red O staining and a triglyceride assay kit. Results showed a Hinf I -RFLP in these eight pig breeds and wild pigs, among which Large white, Bamei pig, Hanjiang Black, Hanzhong White, and wild pigs presented with low polymorphism while the other breeds had intermediate polymorphism. There was no Hae III or Msp I -RFLPs in the four Chinese local pig breeds tested, but Duroc, Landrace, Large White, Hanzhong White and wild pig had polymorphism. Landrace, Large White and wild pigs had low levels of Hae III- and Msp I -RFLP, whereas others had intermediate polymorphism. H-FABP genotypes significantly affected the IMF content ($P < 0.05$). The IMF content ordered by H-FABP genotypes were $HH > Hh > hh$, $DD < Dd < dd$, and $AA < Aa < aa$. The genetic effect values were 3.89, 3.42, 3.17, 2.27, 2.49, 2.91, 2.28, 2.70, and 2.95, respectively. Fat deposition in adipocytes was stronger in the HH, dd and aa genotypes than in others. The results suggest that porcine meat quality may be improved by increasing the frequency of genotype aa-dd-HH in pig breeds.

Key words

[pig breeds](#); [H-FABP gene](#); [polymorphism](#); [IMF content](#); [lipid droplets](#); [adipocyte](#)

DOI:

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