RELATIONSHIP OF INTRAMUSCULAR FAT, FATTY ACIDS AND CONJUGATED LINOLEIC ACIDS WITH TENDERNESS IN PORK

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Introduction

Intramuscular fat (IMF) that is a primary visual stimulus to customers plays an important role in driving people to purchase meat. It is generally accepted that a higher level of IMF has a positive influence on tenderness, but not been illustrated consistently (Brewer, 2001; Fernandez, 1999a & 1999b; Van Laack, 2001). Conjugated linoleic acids (CLA) has anticancerogenic, antiatherogenic, antidiabetic effects and so on. Its content and division maybe are also relative with meat tenderness. With increasing of unsaturated/ *cis* fatty acids and decreasing of *trans* fatty acids (FA), the meat hardness will reduced correspondingly (Wood, 2003). The couple of C18:0/C18:2 or CLA may be a key factor for pork tenderness.

The aim of this study was to research the relationship between IMF/FA/CLA and pork tenderness. The mathematical model for IMF/FA/CLAlinking pork tenderness was to be built up.

Materials and Methods

M. longissimus dorsi (LD) was obtained from nine kinds of crossbred swines (9 groups) at 10-12 rib (n = 66). LD samples were stored at 3±1°C for 3 d to test their shear force. 1) A piece of LD (3cm thickness) was heated at 80°C in water bath, the middle temperature of meat up to 70°C and kept 10min, then cooled at 2°C for 12 h. 10-12 meat columns from the same piece (∮ = 1.27cm) were determined shear force (SF)with tenderometer (C-LM3, PRC). IMF(Fortin, 2005), ether-16 FAs (containing a couple of CLA; Aldai, 2006) were analysed by Saxhlet and gas-chromatography, respectively. All of data were treated as Means ± SD with one-way analysis of variance (ANOVA) by SPSS 13.0. Pearson correlation coefficients and regression equations were set up.

Results and Discussion

Rrelationship between IMF content and pork tenderness in 9 groups. IMF content in LD was the range of 1.37% - 3.78% in 9 crossbreds. There was no the significant negative linear relativity between IMF and SF (r = -0.230, P = 0.074) as Fortin (2005) by Pearson correlation coefficient. However, the $\log^-$ curve relativity ("Inverse" mathematical model) was estimated between both of them. Its regression equation was $Y_{SF} = 0.104 \times 1/X_{IMF\text{-}c}$ ($R^2 = 0.702$, P<0.001***, Figure 1) for pork.

Relationship between FAs and pork tenderness. 16 FAs were assayed by gas-chromatography in this study. In pork, the composition of FAs as saturated and unsaturated FAs was around half by half. There was significant negative relativity between C14:0, C18:2, C18:3 and C22:6 with SF in pork, respectively (r = -0.31, r = -0.48, r = -0.52, r = -0.47; $p < 0.01$**). C18:1 and C18:2 (*cis9/tans11, trans10, cis12)* were UFA in pork mostly. There was logarithmic correlation coefficient betweent FAs and SF, especially up to very significantly in C18:0/C18:2 (r = 0.619, p < 0.01**, Table 1). Both of their relation was clearly by "Logarithmic" mathematical model: $Y_{SF} = 13.678 \times \ln X_{C18:0/C18:2}$, $R^2 = 0.775$, $p < 0.001$***; Figure 2).

Conclusions

There were signicantly negative Log-relativity between IMF content and pork tenderness, while positive Log-relativity between the ratio of C18:0/C18:2 and pork tenderness by "Inverse" curve model. There was significant negative relativity between C14:0, C18:2, C18:3 and C22:6 with SF in pork, respectively

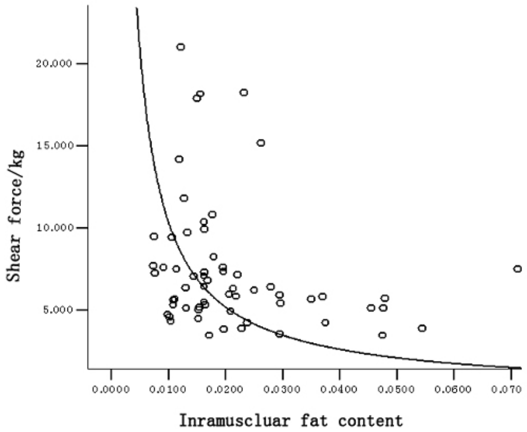

Figure 1 Log relation between IMF and SF

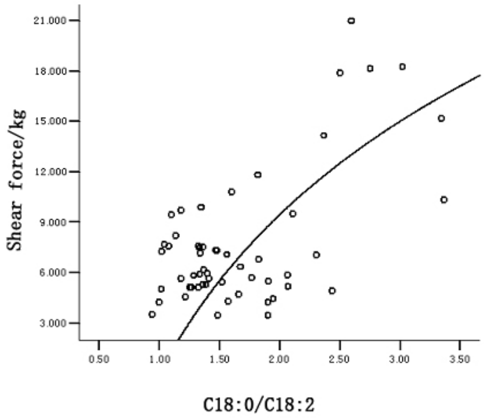

Figure 2 Log relation with the ratio of C18:0/C18:2 and SF

Table 1 Correlation coefficient between FAs and SF in pork

	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9
Y	0.095	-0.306*	0.048	-0.088	-0.192	0.057	0.326*	0.307	-0.484**

	X_{10}	X_{11}	X_{12}	X_{13}	X_{14}	X_{15}	X_{16}	X_6/ X_9
Y	-0.526**	-0.069	0.191	-0.187	0.124	-0.474**	-0.047	0.619**

Notes: Y-SF, X_1-C12:0, X_2-C14:0, X_3-C16:0, X_4-C16:1(c9), X_5-C17:0, X_6-C18:0, X_7-C18:1(c9), X_8-C18:1(t9), X_9-C18:2(c9,12), X_{10}-C18:3(c6,9,12), X_{11}-C18:3(c9,12,15), X_{12}-C20:0, X_{13}-C20:4(c5,8,11,14), X_{14}-C22:4 (c5,8,11,14), X_{15}-C22:6(c4,7,10,13,16,19), X_{16}- C18:2 (*cis9, trans11)*; *p < 0.05 and ** p < 0.01 meant the difference significantly between crossbreds.

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