P - 141

Effect of Fatty Acid Profiles on Sensory Properties of Beef Evaluated by Korean and Australian Consumer Group

S.H. Cho*, B.Y. Park, J.H. Kim, I.H. Hwang, D.H. Kim, Y.K. Kim, J.M. Lee

National Livestock Research Institute

Introduction

The most important aspect of meat quality is eating quality, usually defined as scores given by taste panelists for tenderness, juiciness, and flavor[1]. The fatty acid composition is known to influence not only the nutritional and storage stability, but also the sensory qualities of both fresh and processed meat products as important factors that affect the consumer's choice. Sensory quality of beef can be affected by internal and external factors which are thought to vary between countries. According to the previous research, Korean consumers preferred Hanwoo beef since it contained high intramuscular fat for their consumption[2]. In contrast with Korean consumers, Australian consumers were generally known to prefer lean beef, and intramuscular fat contents did not affect their sensory palatability[3]. However, no study yet has been performed to investigate the differences in perception on quality in relation to fatty acid composition for beef between consumers in different countries. The aim of this study was to investigate the relationship between sensory qualities and fatty acid composition based on consumer liking flavor and overall perception.

Materials and Methods

Animals, sample preparation and sensory evaluation : A total of 18 Korean Hanwoo steers (~ 24 months of age; 150days on a high concentrate ration before slaughter; 313-409kg carcass weight) and 18 Australian Angus steers (~ 24 months of age; 150days on a high concentrate ration before slaughter; 342-423kg carcass weight) were slaughtered in Korea and Australia, respectively. After slaughter, the carcasses were deboned, LD, SM, and TB muscles were removed, vacuum-packed, and aged for 7 days at a 1 °C chiller prior to cutting these into blocks for sensory evaluation and fatty acid analysis. Using the methods described by Gee et al.[4][5], consumers evaluated the sensory parameters such as tenderness, juiciness, flavor, overall liking on a 0-100-point continuous for samples. A total of 1,080 consumers were involved in testing 6,480 samples ([648 samples x 10 consumers per sample] / 6 samples per consumer) in

which 720 Korean consumers were involved in testing 4,320 samples, while 360 Australian consumers were involved in testing 2,160 samples.

Statistical analysis : The 10 consumer scores from each sample were averaged. The relationship least square means for fatty acids and the sensory characteristics were estimated by using a linear model containing consumer group, animal, and muscle cut as fixed effects. For cluster analysis, 4 sensory characteristics were considered as grouping variables. A hierarchical cluster analysis using Ward method was undertaken with the SAS CLUSTER procedure[6].

Results and discussion

Tenderness was significantly different depending on cattle and cut ($p<0.05$), but it was not different among the consumer groups (Table 1). However, juiciness, like flavor and overall liking scores, were significantly different among consumer groups, cattle, and cut ($p<0.05$). Table 2 showed the simple correlation coefficients between sensory properties and overall likeness from 648 consumer responses. The saturated fatty acids such as C16:0 and C18:0 were positively correlated with all sensory traits, while the unsaturated fatty acids such as C16:1n7, C18:2n6, C20:2n6, C20:3n6, C20:4n6, and C22:4n6 were negatively correlated with all sensory traits($p<0.05$). In particular, the

Table 1. ANOVA table for fatty acid profiles on consumer, cattle, and their interactions

Variables	Consumer group	Cattle	Cut	Consumer*Cut	Cattle*Cut
SFA	126.70 ***	506.82 ***	668.67 ***	10.55 ***	42.19 ***
MUFA	65.37 ***	261.49 ***	384.66 ***	13.96 ***	55.84 ***
PUFA	18.44 ***	73.77 ***	93.49 ***	9.51 ***	38.05 ***
n3	245.94 ***	983.78 ***	139.90 ***	11.75 ***	46.99 ***
n6	40.74 ***	162.95 ***	85.87 ***	12.08 ***	48.33 ***

Table 2. Correlation coefficients between fatty acids and sensory properties

	Tenderness	Juiciness	Like-flavor	Overall likeness
SFA	0.29**	0.15**	0.24**	0.27
MUFA	-0.18**	-0.05	-0.18**	-0.16**
PUFA	-0.34**	-0.28**	-0.20**	-0.32**
n3	-0.04	-0.09*	0.02	-0.03
n6	-0.34**	-0.27**	-0.21**	-0.32**

polyunsaturated fatty acids had significant negative correlation with tenderness, flavor, juiciness, and overall likeness. Clustering analysis was used for the consumers with similar preference ranges in beef evaluation (Table 3). It should be noted that only some PUFA such as C20:4n6, C20:5n3, C22:5n3 affected preference clustering for Australian consumers while saturated (C14:0, C16:0 and C18:0) as well as unsaturated fatty acids (C16:1n7, C18:2n6, C18:3n3, C20:3n6, C20:4n6, C20:5n3, C22:4n6, C22:5n3) affected preference clustering for Korean consumers.

Table 3. Means of sensory characteristics (tenderness, juiciness, like-flavor, overall likeness) clustered for all consumers by Ward method and ANOVA results of comparing cluster means of fatty acids

Consumer	Korean consumer						Australian consumer		
Cattle	Angus			Hanwoo			Angus		
Cluster	1	2	3	1	2	3	1	2	3
Tenderness***	75.22	62.75	47.21	75.20	61.60	43.85	73.57	61.17	46.09
Juiciness***	9.95	59.64	54.66	69.60	62.24	54.24	72.56	62.68	50.54
Like-flavor***	67.92	61.89	56.31	65.81	60.75	55.14	71.02	61.92	53.32
Overall likeness***	71.59	62.63	50.99	71.77	61.47	48.96	73.01	62.14	49.77
SFA	7.16 *** (1 2) (3)			10.20 *** (1) (2 3)			2.85		
MUFA	3.91 * (1 2) (3)			1.51			1.88		
PUFA	9.08 *** (1) (2 3)			12.62 *** (1) (2 3)			2.63		
n3	12.31 *** (1) (2 3)			6.96 ** (1 2) (3)			4.66 * (1) (2 3)		
n6	7.53 *** (1) (2 3)			12.58 *** (1 2) (3)			2.15		

* : P<0.05, ** : P<0.01, ***: P<0.001

(ab) means that cluster a and cluster b can be combined into the same group.

Summary

Total contents of fatty acid compositions such as SFA, MUFA, and PUFA affected the beef preference more for Korean consumers than for Australian consumers while most of fatty acids had no relationship with the beef preference for Australian consumers. Although variations in the absolute concentration and in the relative proportions of different fatty acids would affect the flavor profile, the effect of fatty acids on the preference for clustering depended more on consumer groups than on beef origin.

References

1. Wood, J. D. et al. (2004). *Meat Sci. 67,* 651-667.

2. Kim, I. S. et al. (1999) *Kor. J. of Food Sci. and Ani. Resour.*, 4, 331-338.
3. Thompson. J. (2002). Managing meat tenderness, *Meat Sci.* 62, 295-308.
4. Gee, A. et al. (1998). Design and protocol for steak grilling trials. MSA, Sydney.
5. Gee, A. & Polkinghorne, R. (2002). Design and protocol for Korean BBQ taste test sensory trials. MSA, Sydney.
6. SAS. (1996). SAS STAT User's Guide. Statistics. Cary NC.