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Alternative Muscles for Traditional Japanese and Korean Beef Recipes

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Summary

This research was conducted to identify alternative cuts that would be acceptable in popular dishes in Japan and Korea in order to encourage usage of a broader portion of beef carcasses that qualify for export. Typical dishes were tested twice (6 panels per country) using traditional and three alternative beef muscles. Dishes were compared regarding appearance, aroma, juiciness, tenderness, flavor, and overall acceptability by natives of each country who served as panelists. Japanese dishes were sukiyaki (sauté), shabu-shabu (hot pot), and yakiniku (grill); Korean dishes were jang jo rim (boiled), miyeok-guk (soup), and kalbi (grill). Alternative muscles were selected because of their cost, sensory characteristics, lack of popularity for export, and the opportunity to increase exports. There were relatively few differences among muscles in each of the dishes. Results indicate that other muscles may be used to replace traditional beef cuts in Japanese and Korean dishes, suggesting nontraditional U.S. beef cuts for the Asian market.

Introduction

Currently, only beef from animals less than 21 months of age is allowed to be exported from the U.S. into Japan. A relatively small percentage of U.S. cattle meet this requirement and are verifiable. As a result, carcasses that qualify are valuable, and the most return could be obtained by exporting as much of the beef from those carcasses as possible. Unfortunately, Asian countries typically limit their orders to a few cuts from the chuck and, to a lesser

degree, some steak cuts. Accordingly, this research was conducted to identify alternative muscles for export into Japan and Korea, our largest Asian markets.

Procedure

Popular meat dishes from Japan and Korea that commonly contain U.S. beef were selected. Each dish was prepared using four different muscles: the muscle traditionally used and three alternative muscles. The four versions of each dish were served to citizens of those countries in each of two different taste panel sessions. Three different dishes were evaluated, making a total of 6 panel sessions per country. The objective was to determine if citizens of Japan and Korea could tell a difference between the various muscles and if they had a preference for one muscle over another.

A citizen cook was identified from each country. These were people who had moved to the U.S. within the previous 2 years (approximately) and were familiar with the dishes, cooking styles and methods of their country. They were not trained chefs.

For Japan, the three dishes were sukiyaki (sauté), shabu-shabu (hot pot), and yakiniku (grill); Korean dishes were jang jo rim (boiled), miyeok-guk (soup), and kalbi (grill). These dishes were selected, in part, because they presented a variety of cooking methods.

Native Japanese (n = 30 per session) and Korean (n = 20 per session) consumers served as panelists. The cooking occurred in a university residence hall kitchen and panels were conducted in the dining area. Panelists were volunteers and their participation entered them into a prize drawing.

Beef came from upper 2/3 Choice carcasses. It was aged at least 2 weeks and was thinly sliced per instructions from the citizen cook.

Results

Table 1 lists the traditional muscle used for each dish, alternative muscles, their anatomical location, and the general cooking style/method. It is evident that alternative muscles came from parts of the carcass that are not traditionally exported into these countries. The alternative muscles were selected because of their cost, sensory characteristics, lack of popularity for export, and the opportunity to increase exports.

All of the muscles performed equally for the Japanese dish called sukiyaki (Table 2). There were no differences in sensory characteristics among the four versions of sukiyaki. This means any of the muscles could be used in this popular dish with equal consumer satisfaction. Of the four muscles used for shabu-shabu, only 1 was rated lower than the others in appearance, juiciness, tenderness and overall acceptability, and that was the *Semimembranosus* (top round). The m. *triceps brachii* (shoulder clod) was judged by panelists to be more tender than the traditional muscle (m. *rectus femoris* from the round knuckle). For yakiniku, the Japanese panelists easily picked out the traditional muscle (m. *serratus ventralis* or short rib) as being more desirable for juiciness, tenderness, flavor, and overall acceptability when compared to the m. *tensor fascia latae* (tri-tip). There were no differences among the other two alternative muscles studied and the traditional muscle used for yakiniku.

Collectively, there appears to be considerable opportunity to substitute alternative muscles in popular Japanese dishes. This represents economic opportunity for purveyors in Japan and for exporters here in the U.S.

For Korean consumers there were few differences among the muscle studies for jang jo rim (Table 3). The

(Continued on next page)

bottom round (*m. biceps femoris*) was judged to be significantly more tender than the traditional *m. semitendinosus* (eye of round). Otherwise there were no differences among muscles and traits for this popular dish. Similarly, no differences were found for kalbi. This is very encouraging because the traditional muscle (*m. serratus ventralis* – short rib) is highly prized and relatively expensive compared to the alternatives. The demand for *m. serratus ventralis*, in fact, is estimated by the U.S. Meat Export Federation to exceed supply in the next few years. The opportunity to offer alternative muscles will be attractive to consumers, processors, and exporters.

For miyeok-guk (often called wedding soup in Korea because of the occasion when it is often served), panelists were least satisfied with the *m. semimembranosus* (top round) as an alternative muscle. All other muscles were judged to be equal in individual sensory traits and in overall acceptability. Once again the advantages of marketing an alternative to the *m. serratus ventralis* should be of value.

Conclusion

Citizens from Japan and Korea demonstrated that there are a number of muscles from the round and sirloin region that are acceptable in popular recipes from these countries. The opportunity exists to significantly increase the value of selected muscles by selling them as alternatives to common cuts in these Asian markets.

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Table 1. Traditional and alternative muscles used in Japanese and Korean recipes.

Country	Dish	Muscle Category	Muscle Name	Carcass Location	Cooking Method
Japan	Sukiyaki	Traditional	<i>Longissimus dorsi</i>	Loin	Sauté
		Alternative	<i>Biceps femoris</i>	Bottom round	
		Alternative	<i>Rectus femoris</i>	Round knuckle	
		Alternative	<i>Semimembranosus</i>	Top round	
	Shabu Shabu	Traditional	<i>Rectus femoris</i>	Round knuckle	Hot pot
		Alternative	<i>Tensor fascia latae</i>	Tri-tip	
		Alternative	<i>Triceps brachii</i>	Shoulder clod	
		Alternative	<i>Semimembranosus</i>	Top round	
	Yakiniku	Traditional	<i>Serratus ventralis</i>	Short rib	Grill
Alternative		<i>Biceps femoris</i> (proximal end)	Top sirloin cap		
Alternative		<i>Infraspinatus</i>	Flat iron		
Alternative		<i>Tensor fascia latae</i>	Tri-tip		
Korea	Jang Jo Rim	Traditional	<i>Semitendinosus</i>	Eye of round	Boil
		Alternative	<i>Biceps femoris</i>	Bottom round	
		Alternative	<i>Trapezius</i>	Chuck lifter meat	
		Alternative	<i>Pectoralis major</i>	Brisket	
	Kalbi	Traditional	<i>Serratus ventralis</i>	Short rib	Grill
		Alternative	<i>Tensor fascia latae</i>	Tri-tip	
		Alternative	<i>Biceps femoris</i> (proximal end)	Top sirloin cap	
		Alternative	<i>Infraspinatus</i>	Flat iron	
	Miyeok-guk	Traditional	<i>Serratus ventralis</i>	Short rib	Soup
		Alternative	<i>Semimembranosus</i>	Top round	
		Alternative	<i>Digital extensor</i>	Heel	
		Alternative	<i>Tensor fascia latae</i>	Tri-tip	

Table 2. Sensorial attributes of the Japanese taste panel.

Dish	Attributes	Muscles				P-value
		<i>Biceps femoris</i>	<i>Longissimus dorsi</i> *	<i>Rectus femoris</i>	<i>Semimembranosus</i>	
Sukiaki						
	Appearance	8.40	8.20	8.23	8.01	0.28
	Aroma	7.97	8.17	7.76	7.14	0.10
	Juiciness	7.17	6.67	6.28	6.33	0.25
	Tenderness	7.00	7.49	7.11	6.87	0.68
	Flavor	8.35	8.57	7.75	7.46	0.10
	Overall	8.34	8.18	7.90	7.38	0.15
Shabu Shabu						
		<i>Tensor fascia latae</i>	<i>Rectus femoris</i> *	<i>Triceps brachii</i>	<i>Semimembranosus</i>	
	Appearance	8.69 ^a	7.65 ^{ab}	7.64 ^{ab}	6.67 ^b	0.0072
	Aroma	7.15	7.04	7.43	6.65	0.54
	Juiciness	7.60 ^a	7.22 ^{ab}	8.33 ^a	6.33 ^b	0.01
	Tenderness	7.98 ^{ab}	7.75 ^b	9.00 ^a	6.81 ^b	0.0057
	Flavor	8.18	7.53	8.49	7.19	0.17
	Overall	8.21 ^a	8.04 ^{ab}	8.88 ^a	7.04 ^b	0.02
Yakiniku						
		<i>Biceps femoris</i> (proximal end)	<i>Infraspinatus</i>	<i>Serratus ventralis</i> *	<i>Tensor fascia latae</i>	
	Appearance	9.45	8.97	9.28	9.05	0.85
	Aroma	9.20	8.59	9.13	8.51	0.49
	Juiciness	8.11 ^b	8.22 ^b	9.92 ^a	7.15 ^b	< 0.0001
	Tenderness	9.27 ^a	9.15 ^a	10.08 ^a	7.56 ^b	0.0003
	Flavor	9.86 ^a	8.72 ^{ab}	10.18 ^a	8.46 ^b	0.01
	Overall	9.61 ^a	8.95 ^{ab}	10.16 ^a	8.22 ^b	0.0018

*Traditional muscle cut used for each recipe.

Rating Scale - Unstructured line scale (15 cm long; 0 cm = undesirable and 15 cm = desirable).

^{a,b}Means in the same row having different superscripts are significant at $P \leq 0.05$.

Table 3. Sensorial attributes of the Korean taste panel.

Dish	Attributes	Muscles				P-value
		<i>Biceps femoris</i>	<i>Semitendinosus*</i>	<i>Trapezius</i>	<i>Pectoralis</i>	
Jang Jo Rim						
	Appearance	10.25	11.24	10.90	9.90	0.07
	Aroma	10.26	10.40	10.47	10.17	0.94
	Juiciness	9.84	8.84	8.90	9.28	0.36
	Tenderness	10.39 ^a	8.02 ^b	9.00 ^b	9.27 ^{ab}	0.01
	Flavor	9.85	8.38	9.47	9.52	0.11
	Overall	10.07	8.75	9.48	9.67	0.18
Kalbi						
		<i>Tensor fasciae latae</i>	<i>Serratus ventralis*</i>	<i>Biceps femoris</i> (proximal end)	<i>Infraspinatus</i>	
	Appearance	11.11	10.59	10.44	10.05	0.14
	Aroma	10.48	10.48	10.54	9.97	0.63
	Juiciness	10.45	10.26	10.17	9.45	0.26
	Tenderness	10.00	10.15	10.30	9.14	0.18
	Flavor	10.56	10.73	10.88	9.58	0.07
	Overall	10.64	10.59	10.77	9.71	0.13
Miyeok-guk						
		<i>Semi-membranosus</i>	<i>Digital extensor</i>	<i>Serratus ventralis*</i>	<i>Tensor fasciae latae</i>	
	Appearance	9.05	10.07	10.67	10.26	0.08
	Aroma	8.06 ^b	10.08 ^a	10.25 ^a	9.12 ^{ab}	0.02
	Juiciness	7.08 ^b	9.17 ^a	10.30 ^a	9.09 ^a	< 0.0001
	Tenderness	6.32 ^b	8.87 ^a	10.21 ^a	9.90 ^a	< 0.0001
	Flavor	7.35 ^b	10.00 ^a	10.37 ^a	9.39 ^a	0.0003
	Overall	7.40 ^b	9.79 ^a	9.83 ^a	9.56 ^a	0.0037

*Traditional muscle cut used for each recipe.

Rating Scale - Unstructured line scale (15 cm long; 0 cm = undesirable and 15 cm = desirable).

^{a,b}Means in the same row having different superscripts are significant at $P \leq 0.05$.