

Sensory Differences Among the Beef Value Cuts

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Abstract

Muscle profiling has identified a number of beef muscles with the potential for value enhancement, which may include making steaks from muscles typically used for ground beef or roasts. Flavor characteristics of muscles from the chuck and round are different than those from the rib and loin. The objectives of this research were to compare the sensory characteristics of selected beef value cuts and to determine the effects of degree of doneness and aging on flavor. Two experiments were conducted. In study one, 120 muscles (20 samples from each of infraspinatus, tensor fasciae latae, vastus lateralis, teres major, triceps brachii, and gluteus medius) were cooked to 66 or 77 C on a commercial gas grill and evaluated by a trained sensory panel using 8-point rating scales for juiciness, tenderness, flavor intensity, off-flavor intensity, and (untrained) flavor preference. The frequency of specific off-flavor notes was also determined. In study two, 100 muscles (20 samples of infraspinatus, triceps brachii, rectus femoris, vastus lateralis, and tensor fasciae latae) were aged 7 or 21 days prior to cooking to 72 C for evaluation by the same flavor panel. Cooking the value steaks to a higher degree of doneness resulted in lower juiciness, tenderness, flavor intensity, and flavor preference scores ($P < 0.05$). Regardless of degree of doneness, the infraspinatus had the most favorable ratings for juiciness, tenderness (similar to teres major), flavor intensity, and the following off-flavor notes: liver-like, metallic, musty/oxidized (similar to triceps brachii), acidic, and sour. The teres major was highly rated for juiciness and tenderness, but strong intensity and high frequency of off-flavor notes (especially liver-like and musty/oxidized) were commonly detected. The tensor fasciae latae was similar in flavor to the infraspinatus but slightly lower in tenderness. The other three muscles in study one were similar (except in tenderness, where the gluteus medius was best of the three), and generally rated lower for most flavor traits. Flavor preference of the infraspinatus was reduced by cooking to a higher degree of doneness, although it was still desirable. In study two, aging decreased juiciness and increased tenderness and off-flavor intensity ratings. As is study one, the infraspinatus was rated most desirable for all sensory traits. For the infraspinatus only, aging reduced the flavor preference (apparently related to an increase in musty/oxidized flavor notes), although it was still rated highest among the muscles for flavor preference. The rectus femoris was slightly, but significantly, less desirable in sensory characteristics than the infraspinatus, but was equal or superior to the other muscles studied. Triceps brachii were similar to rectus femoris, except they were less tender. Least desirable in study two was the vastus lateralis from a tenderness and flavor intensity perspective. Taken together, these data indicate the value cuts have good potential as substitutes for steaks. Degree of doneness and aging effects were seldom muscle specific, indicating the muscles respond in a similar manner. The infraspinatus, while dynamic in flavor, was easily the most desirable of all muscles studied.

Key Words: beef, flavor, palatability

Design

Study 1
 5 muscles (see tables)
 2 degrees of doneness (66E, 77E C)
 20 samples of each
 Served 3 m at 2 dod per taste panel session
 11 trained panelists
 Randomized incomplete block (for sensory evaluation)

Study 2
 5 muscles (see tables)
 2 aging periods (7, 21 d)
 20 samples of each
 Served 3 m at 2 aging periods per taste panel session
 10 trained panelists
 Randomized incomplete block (for sensory evaluation)

Address	Tenderness	Flavor Intensity	Off-Flavor Intensity	Flavor Preference
1. Infraspinatus	2. Teres major	3. Tensor fasciae latae	4. Triceps brachii	5. Vastus lateralis
6. Rectus femoris	7. Gluteus medius	8. Infraspinatus	9. Teres major	10. Tensor fasciae latae
11. Triceps brachii	12. Vastus lateralis	13. Rectus femoris	14. Gluteus medius	15. Infraspinatus
16. Teres major	17. Tensor fasciae latae	18. Triceps brachii	19. Vastus lateralis	20. Rectus femoris
21. Gluteus medius	22. Infraspinatus	23. Teres major	24. Tensor fasciae latae	25. Triceps brachii
26. Vastus lateralis	27. Rectus femoris	28. Gluteus medius	29. Infraspinatus	30. Teres major
31. Tensor fasciae latae	32. Triceps brachii	33. Vastus lateralis	34. Rectus femoris	35. Gluteus medius
36. Infraspinatus	37. Teres major	38. Tensor fasciae latae	39. Triceps brachii	40. Vastus lateralis
41. Rectus femoris	42. Gluteus medius	43. Infraspinatus	44. Teres major	45. Tensor fasciae latae
46. Triceps brachii	47. Vastus lateralis	48. Rectus femoris	49. Gluteus medius	50. Infraspinatus
51. Teres major	52. Tensor fasciae latae	53. Triceps brachii	54. Vastus lateralis	55. Rectus femoris
56. Gluteus medius	57. Infraspinatus	58. Teres major	59. Tensor fasciae latae	60. Triceps brachii
61. Vastus lateralis	62. Rectus femoris	63. Gluteus medius	64. Infraspinatus	65. Teres major
66. Tensor fasciae latae	67. Triceps brachii	68. Vastus lateralis	69. Rectus femoris	70. Gluteus medius
71. Infraspinatus	72. Teres major	73. Tensor fasciae latae	74. Triceps brachii	75. Vastus lateralis
76. Rectus femoris	77. Gluteus medius	78. Infraspinatus	79. Teres major	80. Tensor fasciae latae
81. Triceps brachii	82. Vastus lateralis	83. Rectus femoris	84. Gluteus medius	85. Infraspinatus
86. Teres major	87. Tensor fasciae latae	88. Triceps brachii	89. Vastus lateralis	90. Rectus femoris
91. Gluteus medius	92. Infraspinatus	93. Teres major	94. Tensor fasciae latae	95. Triceps brachii
96. Vastus lateralis	97. Rectus femoris	98. Gluteus medius	99. Infraspinatus	100. Teres major

Objectives

- Determine the effects of degree of doneness and aging on flavor
- Compare the sensory characteristics of selected beef value cuts

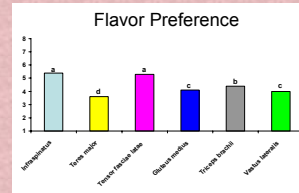
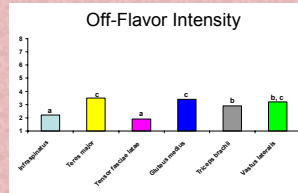
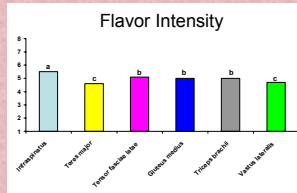
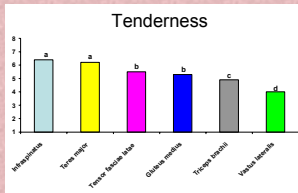
Degree of Doneness Effects

Muscle	Juiciness		Tenderness		Flavor Intensity		Off-Flavor Intensity		Flavor Preference	
	66E C	77E C	66E C	77E C	66E C	77E C	66E C	77E C	66E C	77E C
Infraspinatus (top blade)	6.6 ^a	5.3 ^a	6.5	6.3	5.5	5.4	1.9 ^a	2.4 ^b	5.8a	5.1 ^b
Teres major (shoulder tender)	5.9 ^a	4.6 ^a	6.4	6.1	4.7	4.5	3.6	3.4	3.7	3.6
Tensor fasciae latae (tri-tip)	6.0 ^a	4.9 ^a	5.8 ^a	5.3b	5.2	5.0	1.9	2.0	5.4	5.2
Gluteus medius (top butt)	5.0 ^a	3.7 ^a	5.6 ^a	5.0b	5.0	5.1	3.6	3.2	4.2	4.1
Triceps brachii (clod heart)	5.3 ^a	3.6 ^a	5.1	4.8	5.2 ^a	4.8 ^b	2.7	3.0	4.8a	4.1 ^b
Vastus lateralis (knuckle side)	5.2 ^a	3.2 ^a	4.2 ^a	3.7b	4.9 ^a	4.5 ^b	3.4 ^a	2.9 ^b	4.1	3.8

a,b Means in the same row within a sensory trait bearing different superscripts are significantly different ($P < 0.05$).

Muscle	Charred		Liver-Like		Metallic		Musty/Oxidized		Acidic		Sour	
	66E C	77E C	66E C	77E C	66E C	77E C	66E C	77E C	66E C	77E C	66E C	77E C
Infraspinatus (top blade)	19.1 ^a	40.0 ^b	14.8	11.2	7.3	3.1	19.6 ^a	32.6 ^b	6.6	2.2	1.1	0.0
Teres major (shoulder tender)	6.0	1.1	37.7	35.4	38.1 ^a	17.8 ^b	42.5	52.8	27.6	17.6	6.6	6.6
Tensor fasciae latae (tri-tip)	12.2	18.7	9.0	7.0	20.4 ^a	6.1 ^b	14.2 ^a	26.8 ^b	23.1	14.4	5.5	1.1
Gluteus medius (top butt)	22.8	31.0	19.3	31.3	29.5 ^a	16.9 ^b	42.1	35.8	36.5	26.6	6.6 ^b	1.1 ^a
Triceps brachii (clod heart)	12.6 ^a	46.1 ^b	25.1	25.4	32.92 ^a	6.1 ^b	18.4	27.8	28.6 ^a	11.0 ^b	3.3	1.1
Vastus lateralis (knuckle side)	6.0	18.7	35.1	36.0	40.4 ^a	20.5 ^b	28.8	31.8	28.8	22.0	5.5	5.5

a,b Means in the same row within a sensory trait bearing different superscripts are significantly different ($P < 0.05$).



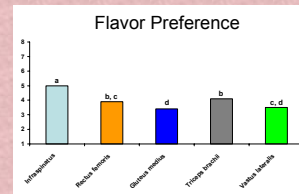
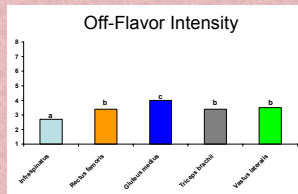
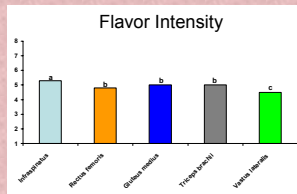
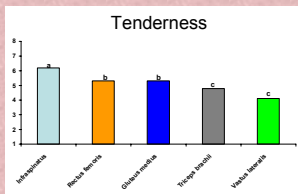
Aging Effects

Muscle	Juiciness		Tenderness		Flavor Intensity		Off-Flavor Intensity		Flavor Preference	
	7 d	21 d	7 d	21 d	7 d	21 d	7 d	21 d	7 d	21 d
Infraspinatus (top blade)	5.9	5.7	3.9 ^a	6.4 ^a	5.4 ^a	5.1 ^b	2.4 ^a	3.0 ^b	5.3 ^a	4.7 ^b
Triceps brachii (clod heart)	5.2 ^a	4.5 ^b	4.7	4.9	5.0	5.1	3.3	3.6	4.1	4.1
Rectus femoris (knuckle center)	4.7	4.3	5.1	5.5	4.8	4.8	3.4	3.4	3.8	3.9
Vastus lateralis (knuckle side)	3.9	4.0	4.0	4.2	4.5	4.5	3.4	3.6	3.6	3.4
Gluteus medius (top butt)	4.0	4.1	5.4	5.2	4.9	5.1	3.8	4.2	3.6	3.3

a,b Means in the same row within a sensory trait bearing different superscripts are significantly different ($P < 0.05$).

Muscle	Charred		Liver-Like		Metallic		Musty/Oxidized		Acidic		Sour	
	7 d	21 d	7 d	21 d	7 d	21 d	7 d	21 d	7 d	21 d	7 d	21 d
Infraspinatus (top blade)	24.7	21.1	21.2	19.6	3.2	8.3	30.5 ^a	47.2 ^b	8.1	9.5	2.0	4.7
Triceps brachii (clod heart)	18.3	29.4	31.2	41.9	23.1	19.3	37.0	27.3	19.7	19.4	7.7	2.9
Rectus femoris (knuckle center)	10.8	24.9	25.8	23.6	13.7 ^a	27.5 ^b	47.8	37.6	24.5	23.7	10.6 ^b	2.9 ^a
Vastus lateralis (knuckle side)	31.7	23.1	24.4	31.0	18.6	21.8	42.9	39.6	15.3	22.1	4.1	6.0
Gluteus medius (top butt)	22.8	28.3	26.5	22.6	19.3	23.2	43.3	41.0	34.8 ^a	45.3 ^b	7.1	6.9

a,b Means in the same row within a sensory trait bearing different superscripts are significantly different ($P < 0.05$).



Conclusions:

The infraspinatus was equal or superior to all other muscles in most sensory traits. Degree of doneness and aging effects were similar among most muscles.