



## PROJECT SUMMARY PRODUCT QUALITY

**BEEF**  
RESEARCH

### Targeted Aging for Beef

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## Targeted Aging for Beef: Project Summary

### Background

On October 26, 2012 the USDA Agricultural Marketing Service announced a program pertaining to meat tenderness labeling claims. Carcasses with Ribeyes that meet the criteria established by ASTM International (2012; formerly the International Society of Testing and Materials) for Tender and Very Tender meat may carry a labeling claim for tenderness and therefore would be entitled to have the USDA Certified Tender and USDA Certified Very Tender shields on the label. Tender is defined as meat having a Ribeye with a slice shear force (SSF) value below 20.0 kg after two or more weeks of aging and Very Tender is defined as having a SSF value below 15.3 kg. The USDA program allows carcasses that meet these SSF standards for the Ribeye to also apply the tenderness label to the Tri-Tip (*Tensor fascia latae*), Knuckle Center (*Rectus femoris*), Knuckle Side (*Vastus lateralis*), Tenderloin (*Psoas major*), Flat Iron (*Infraspinatus*), Ribeye Cap (*Spinalis dorsi*), Shoulder Petite Tender (*Teres major*) and Denver Steak (*Serratus ventralis*), as well as the Ribeye and Strip Loin. That is, if a carcass Ribeye can be certified as Very Tender so can these other cuts, and approximately 68 kg per carcass can benefit from the USDA tenderness label.

However, a number of economically important muscles that are intermediate in tenderness are not included on the list, including the Clod Heart, Top Round and Sirloin. Together these cuts would add about 45 kg to the list of cuts that could bear a tenderness designation. Because they are not as tender as the Ribeye, they may be able to carry a label as Certified Tender when the Ribeye is certified as Very Tender. Data are needed to verify that this would be an appropriate labeling strategy.

### Objectives

The objectives of this research were to (1) determine if tender beef requires the same aging time as beef that is not tender, and (2) determine if muscles from the same carcass have equivalent responses to aging.

### Methods

Carcasses (n= 120) were selected from a single beef packing plant after grading: USDA upper 2/3 Choice, low Choice and Select (40 per grade). Beef tenderness was assessed on three different subprimal muscles; *Longissimus dorsi* (LD), *Gluteus medius* (GM) and *Infraspinatus* (IS) of each carcass. The muscles were trimmed and fabricated on the 7<sup>th</sup> day post-mortem. Every muscle was cut into 5 steaks with an automatic slicer. Each steak was individually identified, vacuum-packaged and aged for 7, 14, 21, 28 or 35 days. Slice shear force was measured on thawed steaks that were cooked on a belt grill.


The LD values at 14 days of age were used to classify carcasses according to USDA categories for meat tenderness: Very Tender (SSF < 15.3 kg), Tender (SSF = 15.4 – 19.9 kg) and Not Certified (SSF > 20.0 kg).

### Important Findings

Carcasses were grouped into tenderness categories by LD SSF values at 14 days of age to identify possible aging patterns for the GM and IS. All IS muscles responded to aging in a similar manner; there were no differences in tenderness among IS groups defined by 14 day LD tenderness categories. The GM from carcasses classified as Not Certified were significantly less tender than the Tender and Very Tender groups, which were similar. No discernible differences in aging pattern among tenderness categories were observed for the GM and IS muscles. In each tenderness category, the aging response was similar between the LD, GM and IS, except in the Not Certified tenderness category. Tenderness of the LD within the Not Certified group significantly dropped in SSF between 21 and 28 days of aging while the other muscles within that group continued in a gradual SSF decline pattern.

Muscles categorized as Very Tender required 9, 30 and 13 days of aging to certify the LD, GM and IS, respectively, as Very Tender. The population tenderness distribution after 7 days of aging showed 85% of LD, 56% of GM and 88% of IS would fall under the Tender (Very Tender + Tender) category. Muscles within the Tender category would require 25, 29 and 11 days age for LD, GM and IS, respectively, to be considered Very Tender. In terms of population tenderness distribution, 53% of LD, 49% of GM and 98% of IS would fall under the Tender (Very Tender +

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Tender) category at 7 days of age. For muscles in the Not Certified tenderness category, only the IS was able to qualify as Very Tender with 13 days of age. The LD and GM required 23 days and 17 days, respectively, to classify as Tender within the Not Certified group. In terms of population tenderness distribution, 14% of LD, 28% of GM and 95% of IS would fall under the Tender category at 7 days of age. Based on these observations, tougher beef does not require the same aging time as tender beef to meet the USDA tenderness standards when carcasses are sorted based on LD tenderness at 14 days of age.

Different muscles within a carcass have varying responses to aging. Thus, different muscles reach target tenderness values at different aging times. These findings were confirmed via correlation analysis that indicated no relationship between the rates of change in SSF among the muscles at any of the aging time points.

## Implications

Irrespective of 14 day LD tenderness categories, tender and not tender beef require different aging times to qualify for USDA tenderness claims. Also, muscles within the same carcass age at different rates and patterns. Thus, sorting carcasses based on LD tenderness at 14 days of age does not present a practical application for labeling beef muscles with intermediate SSF values into USDA tenderness categories.

**Table 1.** Slice shear force (SSF) values of muscles from carcasses classified as Very Tender, Tender or Not Certified based on the *Longissimus dorsi* SSF at day 14.

Aging (Days)	Muscles (kg)		
	<i>Longissimus</i>	<i>Gluteus medius</i>	<i>Infraspinatus</i>
<i>Very Tender</i> <sup>*1</sup>			
7	16.06 <sup>b</sup>	19.78 <sup>a</sup>	16.20 <sup>b</sup>
14	12.95 <sup>c</sup>	17.62 <sup>a</sup>	15.37 <sup>b</sup>
21	13.25 <sup>b</sup>	16.88 <sup>a</sup>	13.83 <sup>b</sup>
28	12.43 <sup>b</sup>	15.70 <sup>a</sup>	12.21 <sup>b</sup>
35	12.38 <sup>b</sup>	14.33 <sup>a</sup>	12.06 <sup>b</sup>
<i>Tender</i> <sup>*2</sup>			
7	20.81 <sup>a</sup>	20.20 <sup>a</sup>	15.91 <sup>b</sup>
14	17.64 <sup>a</sup>	17.77 <sup>a</sup>	15.26 <sup>b</sup>
21	16.08 <sup>a</sup>	17.06 <sup>a</sup>	13.38 <sup>b</sup>
28	14.77 <sup>b</sup>	16.17 <sup>a</sup>	12.41 <sup>c</sup>
35	14.41 <sup>a</sup>	13.74 <sup>a</sup>	11.90 <sup>b</sup>
<i>Not Certified</i> <sup>*3</sup>			
7	27.17 <sup>a</sup>	21.63 <sup>b</sup>	16.04 <sup>c</sup>
14	24.94 <sup>a</sup>	20.35 <sup>b</sup>	15.63 <sup>c</sup>
21	23.09 <sup>a</sup>	19.37 <sup>a</sup>	14.20 <sup>b</sup>
28	17.45 <sup>a</sup>	17.78 <sup>a</sup>	12.63 <sup>b</sup>
35	16.97 <sup>a</sup>	16.37 <sup>a</sup>	12.42 <sup>b</sup>

\* Very Tender (SSF = <15.3 kg); Tender (SSF = 15.4 – 19.9 kg) and Not Certified (SSF = > 20.0 kg)

<sup>1</sup>Standard error within Very Tender comparisons = 0.6072

<sup>2</sup>Standard error within Tender comparisons = 0.5714

<sup>3</sup>Standard error within Not Certified comparisons = 0.7732