

Effects of Blast Chilling on Fresh Pork Quality in Cuts from the *Psoas Major*, *Semimembranosus*, and *Triceps Brachii*

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Summary and Implications

Carcasses (n=40) with defined fat free lean and carcass weight were selected 45 minutes postmortem. Carcasses were split and sides subjected to conventional chill (CC) or blast chilling (BC) regimens. The *Psoas Major* (PM) from BC sides had increased purge loss, but was juicier, more tender and less chewy than the PM from CC sides. The *Semimembranosus* (SM) from BC sides had higher 30 hour pH, darker color scores, and had a lower Hunter a value than the SM from CC sides. No treatment effect was found in the *Triceps Brachii*.

Introduction

To maintain production efficiency and ensure the production of microbiologically safe products, fresh pork processing facilities maintain the use of blast chilling regimens in the processing of pork carcasses. It has been documented that with the use of blast chilling, severe cases of rapid pH decline leading to pale soft and exudative pork defects are avoided. Improvements in color, reduced purge and cook loss, and more uniform product are achieved with the use of blast chilling (BC). Recent studies have suggested that current industry practices and the use blast chilling may have a detrimental effect on fresh pork loin tenderness. Due to muscle location and variations in fiber type, chilling rate does not impact muscles equally. This study compared the effects of blast chilling on fresh pork quality in separate muscles.

Materials and Methods

Carcasses were selected on the production floor. Carcasses were selected based on carcass weight (CWT) (86 to 91 kg) and fat free lean (FFL) (54 to 57% lean). Carcasses were selected in groups of ten on four nonconsecutive slaughter dates. Carcasses were split approximately 45 minutes postmortem and alternating sides were assigned either blast chill (BC) or conventional chill

(CC) treatments. BC sides were chilled at -32°C for 90 minutes and held at 2°C for 28 hours. While CC sides were spray chilled and held at 2°C for 30 hours. Muscles from the *Psoas Major* (PM), *Semimembranosus* (SM), and the *Triceps Brachii* (TB) were collected approximately 30 hours postmortem. Aged fresh pork (PM 7D, SM 8D, and TB 13D) was used for trained panel sensory analysis (n=4) and ultimate pH measurements. Panelists evaluated steaks (SM) or roasts (PM, TB) for tenderness, juiciness, chewiness, flavor, and off flavor. A ten point scale was used for attributes from low intensity to high intensity. Instrumental measurements of tenderness were collected to determine treatment effect on Warner-Bratzler shear (WBS) force and star probe analysis. Color scores (National Pork Board standard six point scale, 1=pale pinkish gray to white; 6=dark purplish red) marbling scores (National Pork Board standard ten point scale, 1= 1.0% Intramuscular Fat; 10= 10.0% Intramuscular Fat) were assigned to chops, Hunter L a* b* values were collected. Statistical analysis were conducted using SAS Enterprise Guide 5.1 using PROC MIXED with Treatment, Harvest and Treatment*Harvest as fixed effects and Animal as a random effect.

Results and Discussion

Treatment effect on percent purge loss was found in roasts from the PM with BC sides having greater percent loss (0.48 CC, 0.74 BC). Additionally, the PM from BC sides were juicier (7.46 CC, 8.31 BC), more tender (7.89 CC, 8.59 BC), and less chewy (2.76 CC, 2.09 BC). Results from the PM are summarized in Table 1. Chilling also had an effect on 30 hour pH in the SM with BC sides having a higher pH (CC 5.56, 5.62 BC) observed color score and a* with SM's from BC sides being darker color scores (3.00 CC, 3.20 BC), and lower Hunter a* values (16.35 CC, 16.02 BC). Results from the SM are summarized in Table 2. These results indicate a difference in initial color value and perhaps color stability due to chilling rate. The quality in roasts from the TB was not affected by chilling treatment (results summarized in Table 3). This study demonstrates the effect of chilling on fresh pork sensory attributes in different muscles. Muscle location likely has an effect on chilling rate of muscle which contributes to fresh pork quality, as demonstrated in the PM as well as the SM.

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Table 1. Treatment Effect on Fresh Pork Sensory Quality in the *Psoas Major*

Trait	CC	BC	SE	<i>p</i> -value
pH ~ 30 hours	5.89	5.94	0.12	0.29
Ultimate pH	5.81	5.82	0.14	0.89
Cook Loss %	10.99	10.44	0.33	0.24
Purge Loss %	0.48	0.74	0.08	0.02*
Color Score	3.78	3.98	0.09	0.13
Hunter L	40.35	40.34	1.65	0.98
Hunter a*	14.68	14.59	0.23	0.79
Hunter b*	1.35	1.36	0.10	0.93
Star Probe (kg)	2.40	2.39	0.07	0.91
Warner-Bratzler Shear force (kg)	2.54	2.47	0.07	0.48
Juiciness	7.46	8.31	0.12	<.0001*
Tenderness	7.86	8.59	0.18	0.005*
Chewiness	2.76	2.09	0.14	0.002*
Flavor	3.54	3.74	0.09	0.13
Off Flavor	1.93	1.94	0.44	0.93

¹Least Square Means reported for each trait

Table 3. Treatment Effect on Fresh Pork Sensory Quality in the *Triceps Brachii*

Trait	CC	BC	SE	<i>p</i> -value
pH ~ 30 hours	5.67	5.64	0.16	0.56
Ultimate pH	5.78	5.77	0.14	0.86
Cook Loss %	27.06	26.58	3.19	0.60
Purge Loss %	1.83	1.82	0.43	0.92
Color Score	2.91	2.86	0.33	0.62
Hunter L	41.79	41.70	1.50	0.82
Hunter a*	16.03	16.02	0.09	0.95
Hunter b*	4.35	4.35	0.41	0.99
Star Probe (kg)	4.93	5.00	0.11	0.64
Warner-Bratzler Shear force (kg)	2.91	3.10	0.09	0.16
Juiciness	5.41	5.66	0.70	0.25
Tenderness	4.74	4.74	0.75	0.99
Chewiness	5.53	5.82	0.86	0.27
Flavor	4.03	3.90	0.31	0.18
Off Flavor	1.26	1.21	0.15	0.32

¹Least Square Means reported for each trait

Table 2. Treatment Effect on Fresh Pork Sensory Quality in the *Semimembranosus*

Trait	CC	BC	SE	<i>p</i> -value
pH ~ 30 hour	5.56	5.62	0.06	0.003
Ultimate pH	5.67	5.72	0.10	0.27
Cook Loss %	21.92	21.13	1.71	0.16
Purge Loss %	3.57	3.52	0.70	0.81
Marbling Score	2.26	2.40	0.10	0.31
Color Score	2.96	3.21	0.09	0.05*
Hunter L	41.76	41.20	0.45	0.39
Hunter a*	16.35	16.02	0.50	0.05*
Hunter b*	3.11	2.93	0.37	0.17
Star Probe (kg)	5.80	5.80	0.10	0.90
Warner-Bratzler Shear force (kg)	4.24	4.22	0.14	0.92
Juiciness	4.77	5.07	0.22	0.34
Tenderness	3.36	3.45	0.07	0.39
Chewiness	1.38	1.27	0.15	0.07
Flavor	3.36	3.46	0.07	0.38
Off Flavor	1.38	1.27	0.15	0.07

¹Least Square Means reported for each trait