

## **Project Summary**

**Color and flavor stability of beef gluteus medius as influenced by postmortem aging time and blade tenderization**

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# **Color and flavor stability of beef gluteus medius as influenced by postmortem aging time and blade tenderization: Project Summary**

## **Background**

The beef gluteus medius muscle makes up the majority of the beef top sirloin butt and a portion of the beef strip loin making it an extremely valuable muscle to the beef industry. The beef gluteus medius is known to have a limited color shelf life in a retail display case and tenderness challenges. As a consequence, the meat industry currently uses both postmortem aging and blade tenderization to overcome tenderness challenges with this muscle. However, it is not known what effect longer aging periods past 21 days in combination with blade tenderization have on quality characteristics including color stability and flavor attributes.

The objectives of this research were to 1) determine color and flavor stability of beef gluteus medius muscle during extended postmortem aging times with and without mechanical tenderization; and 2) determine the biochemical factors responsible for color stability of beef gluteus medius at five different postmortem aging periods.

## **Methodology**

15 beef top sirloin butts, IMPS 184, from carcasses with Slight 50 to Small 50 marbling were selected from 3 commercial beef harvest facilities and were randomly assigned to 5 different aging periods. The five aging treatments were 1.) 5 days postmortem, 2.) 19 days postmortem, 3.) 33 days postmortem, 4.) 47 days postmortem, and 5.) 61 days postmortem. Each beef top sirloin butt, IMPS 184, was then left in its original vacuum package and was stored at 2 to 4°C throughout the aging period. On the final day of postmortem aging, each top sirloin butt was removed from its vacuum package and the gluteus medius was removed. The gluteus medius was then cut with the grain at the center to yield two pieces of equal size, which were then randomly assigned to either blade tenderization or control with no mechanical tenderization. The blade tenderized treatment was processed through a commercial blade tenderization machine (Ross model T7001 tenderizer). After tenderization treatments occurred, the gluteus medius pieces were sliced against the grain into 1 inch steaks. Assays were performed to assess lactic acid bacteria, lipid oxidation, metmyoglobin reducing activity, oxygen consumption rate, pH, and color values ( $L^*$ ,  $a^*$ , and  $b^*$ ). Sensory Analysis was conducted using the “Development of a Lexicon for Beef Flavor in Intact Muscle” (Adhikari, 2011). A trained Color Panel evaluated steaks for initial color, display color, and discoloration.

## **Findings**

As expected, both extended postmortem aging and blade tenderization significantly increased tenderness in beef gluteus medius steaks (top sirloin). However, postmortem aging was not as effective as blade tenderization in improving tenderness until day 61 of the study. With increased postmortem aging time the steaks which were cut from aged top sirloin butts were much less color stable as shown by increased display color and discoloration scores. When placing a limit of 25% surface metmyoglobin, top sirloin butts aged 5 days, 19 days, 33 days, 47 days, and 61 days yielded steaks with a color shelf of 4 days, 2 days, 1 day, 1 day, and 1 day respectively. In addition, top sirloins that were blade tenderized were darker in appearance and had higher discoloration scores than controls regardless of postmortem aging time.

Fresh meat undergoes constant change between the three pigments of myoglobin (purple), oxymyoglobin (red), and metmyoglobin (brown) and relies on enzyme systems and

substrate availability to make that happen. As postmortem age increases both enzyme activity and substrate availability decrease resulting in lower metmyoglobin reducing activity as shown in this study. This lower metmyoglobin reducing ability directly relates to the decreased color stability we observed in this study.

Lactic acid bacteria significantly increased with increased aging times, this however did not seem to impact pH significantly or change the flavor profile dramatically.

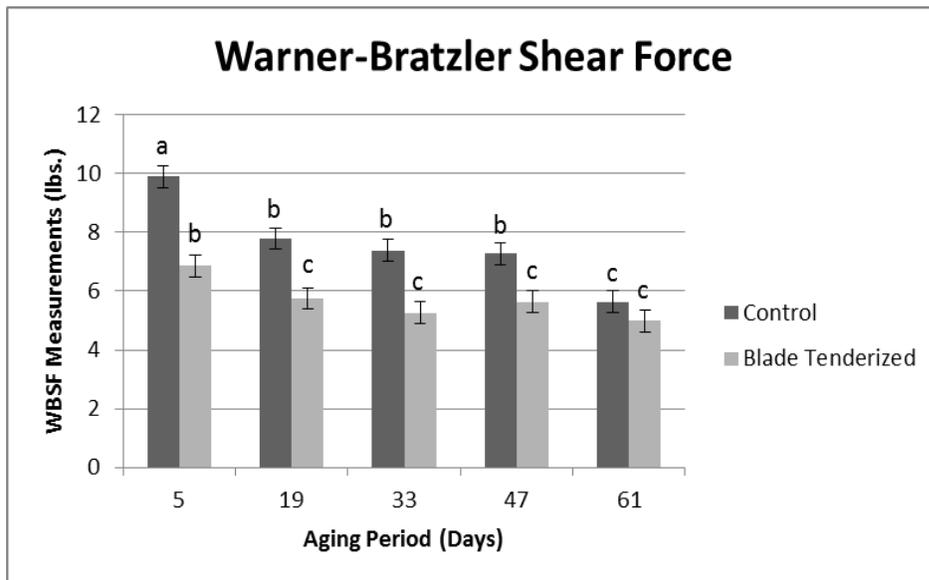
Oxidative rancidity significantly increased for samples with increased aging periods. As a result, samples that were aged longer had more warmed-over flavors present. Additionally, longer aging periods resulted in product with less bitter flavor and less bloody/serumy flavor indicating that flavor changes did occur as aging time increased.

### Implications

Both extended postmortem aging and blade tenderization are very effective tools in increasing tenderness of top sirloin steaks. However, steak cutters looking to increase the tenderness attribute without the use of blade tenderization would only be able to achieve similar tenderness levels as afforded by blade tenderization if the product was aged over 47 days. If extended postmortem aging periods are used the processor or retailer should be aware that retail color shelf life will suffer dramatically. This decrease in shelf life with extended postmortem aging times would be further diminished if blade tenderization were to be employed in conjunction with extended postmortem aging. Additionally, restaurateurs should be mindful that flavor changes should be expected as aging time increases. Specifically, increased amounts of warmed-over flavors could be of concern.

### Figures

The effect of postmortem aging and blade tenderization on the Warner-Bratzler Shear Force Values of beef top sirloin steaks.



<sup>a-c</sup>Means with different superscripts differ ( $P < 0.05$ ).

Standard error of the mean = 0.37

Photos



*Gluteus medius* being processed through blade tenderizer.



2.54 cm steaks being cut to be used for further evaluation.



*Gluteus medius* steaks being overwrapped for simulated retail shelf life.



*Gluteus medius* steaks in coffin style retail case during simulated retail display

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