



Investigating the Effects of Sous Vide Cooking on Tenderness and Protein Concentration in Young Fed and Cow Semitendinosus Muscles

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Objectives

Sous vide is a cooking method where vacuum-packaged food is immersed in a water bath at a precisely controlled temperature. Sous vide cooking offers several benefits that traditional cooking methods cannot. This cooking method provides a consistent degree of doneness across the entire muscle, reducing temperature variation. Additionally, sous vide preserves sensory attributes associated with quality by reducing the loss of flavor volatiles, while also decreasing moisture loss. The objective of this study was to determine the cooking temperature and time required to reduce Warner-Bratzler shear force, while maintaining color and juiciness in a cooked beef *semitendinosus* (eye of round).

Materials and Methods

A total of six *semitendinosus* muscles were used representing two age treatments: young fed beef carcasses (< 30 mo.) ($n = 3$) and cow carcasses ($n = 3$). *Semitendinosus* muscles were portioned into 6 cm roasts and vacuum sealed. The roasts were cooked for 2, 10, and 30 h at 55°C. Shear force, L^* , a^* , b^* values and cooking loss were analyzed in each treatment. Cores were removed from the cooked roasts to determine shear force. The cooked liquid collected from the cook-in bag was used to analyze the soluble, insoluble, and total protein concentrations. Soluble protein concentration was determined using a ThermoFisher Scientific BCA assay and total protein concentration was determined using a Bio-Rad RC DC assay. Insoluble protein was determined by the difference between total and soluble protein. Treatments were replicated three times. Data were analyzed with a mixed model in JMP. The LSM means were compared within an age classification using a Student's t test and considered significant at $P \leq 0.05$.

Results

Warner-Bratzler shear force values for young fed *semitendinosus* showed a significant increase in tenderness as cooking time increased ($P \leq 0.006$). Cow *semitendinosus* shear force values resulted in a significant increase in tenderness between 2 and 10 h ($P \leq 0.033$), but exhibited no additional increase in tenderness at 30 h. Lightness (L^*) values for young fed beef were significantly higher at 30 h ($P \leq 0.036$) compared to 2 and 10 h. However, lightness values were not different between each cooking time in the cow group. Redness (a^*) significantly decreased between 2 and 10 h ($P \leq 0.021$) for the cow group, but exhibited no change in the young fed group. In addition, cooking loss also increased significantly between 2 and 10 h in the cow ($P \leq 0.030$) and young fed ($P \leq 0.014$) beef. Soluble protein concentrations resulted in a significant decrease with time for young fed beef ($P \leq 0.027$). However, the cow group only exhibited a significant decrease between 2 and 10 h ($P \leq 0.003$). Insoluble protein concentrations resulted in no significant differences in both age groups. Lastly, young fed beef resulted in no significant difference in total protein concentrations, while cow *semitendinosus* resulted in a significant decrease across all cooking times ($P \leq 0.019$). The decrease in protein concentrations in both age groups may be a result of a dilution effect as the cooking time increased.

Conclusion

Sous vide cooking resulted in improving tenderness in both young fed and cow *semitendinosus* muscles, while minimizing cooking loss. Additionally, color was able to be maintained between 2 and 10 h for both age groups.