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## Meat and Muscle Biology™



## Temperature and Time Effects of Sous Vide on Tenderness in Beef Semitendinous Muscles

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### Objectives

To determine the time and temperature combination required to improve tenderness in undervalued cuts of beef while maintaining quality attributes; and to understand the biochemical effects of sous vide cooking and how it might be advantageous to tough cuts of meat.

### Materials and Methods

Whole beef semitendinosus muscles (IMPS #171C) were purchased from 2 beef groups: fed beef (< 30 mo. of age;  $n = 20$ ) and cow carcasses (> 42 mo. of age;  $n = 20$ ). Beef muscles were portioned into 6 cm roasts using a template. Roasts were randomly assigned to 1 of 2 cook times: 2 or 8 h at 2 different temperature treatments: 55°C and 70°C. Percent cook loss, objective color ( $L^*a^*b^*$ , Minolta), and Warner-Bratzler shear force (WBSF, kg) were analyzed. Purge accumulated in the cook-in bag was saved and analyzed to determine soluble and total protein concentrations. Soluble protein concentrations were determined using a ThermoFisher Scientific BCA assay and total protein concentrations were determined using a Bio-Rad RC DC assay. 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

WBSF values decreased as time increased for roasts representing the cow group when cooked at 55°C ( $P <$

0.0144). However, roasts representing the fed group resulted in a decrease in WBSF values when temperature was increased from 55°C to 70°C ( $P < 0.002$ ). Lightness values ( $L^*$ ) increased in both groups as time and temperature increased ( $P < 0.0611$ ); whereas, redness values ( $a^*$ ) significantly decreased across all cooking treatments ( $P < 0.0145$ ). Additionally, percent cook loss significantly increased as cooking temperature and time increased in both groups ( $P < 0.0322$ ). Total protein concentrations in the purge significantly decreased as temperature and time increased in both groups ( $P < 0.0287$ ). Cooking loss could be correlated to the decrease in total protein concentrations. As cooking temperature and time increase the amount of water expelled from the muscle (purge) could increase, resulting in a dilution of protein concentration. Soluble protein concentration in both age groups significantly decreased as cooking temperature and time increased ( $P < 0.0266$ ).

### Conclusion

Through the application of sous vide cooking we can improve tenderness in tough cuts of beef, especially undervalued beef cuts originating from cows. To capitalize on value in dealing with cow meat cuts, cooking to an internal degree of doneness of 55°C (rare) for 8+ hours may be the most suitable.