

The effect of sous vide cooking on endogenous proteolytic enzymes in beef brisket (#140)

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Introduction

Sarcoplasmic proteases are crucial in protein catabolism and post-mortem muscle softening. It is believed that two main proteolytic systems are involved in the post-mortem tenderization of meat: the cathepsins and the calpains. Many researchers consider the calpain system, and especially μ -calpain, to be the major contributors to meat tenderness (Bowker et al., 2010, Koochmaraie and Geesink, 2006). However, this assumption is debatable and has not been fully proven (Herrera-Mendez et al., 2006). Meat tenderness, particularly for tougher cuts such as brisket, may also be developed during the cooking step, especially if the meat is heated for a longer duration at temperature that is optimum for enzyme activity (Ertbjerg et al., 2012). This investigation was designed to study the effect of sous vide cooking at different temperatures (50-70°C) for up to 24 h on the activities of endogenous proteolytic enzymes in order to determine their contribution to tenderness of beef brisket.

Methods

Hot boned briskets from three steers were obtained at 6 hours *post-mortem* and were stored at 4°C for 24 hours followed by *sous-vide* cooking in a water bath at 50, 55, 60, 65 or 70°C for 1, 5 or 24 h. Calpain and cathepsin B, H and L activities were determined in the sarcoplasmic protein extracts as described by Chéret *et al.* (2007). Significant differences were determined by one-way ANOVA Tukey test at 95% significance level using Minitab® 17 (Minitab Statistical Software, 2014).

Results

Calpain was found to be active at 50 °C for the first hour but approximately 96% of its activity was lost at temperatures above 55°C after 1 hour. There was an increase in cathepsin B + L activity for meat heat treated at 50°C for 1 hour and increasing the heating time from 1 hour to 24 hours led to a de-

* Each data point represents the mean value from three animals (error bars indicate SD).

crease in activity to about 47 % relative to the untreated meat. Cathepsin B + L were active for the first 5 hours at 55 °C but only retained about 6% of their activity after 24 hours. For cathepsin H, no extractable activity was detected after 5 hours of cooking at 55 °C and above. Based on these results, cathepsin B and L were found to be relatively heat stable at sous vide temperatures (50°C for 24 hours, 55°C for 5 hours and 60°C and 70°C for 1 hour, **Figure 1**) as compared to other endogenous enzymes (calpain and cathepsin H).

Conclusion

These results suggest that cathepsin B and L may contribute to the improved meat tenderness usually seen in sous vide treated meat.

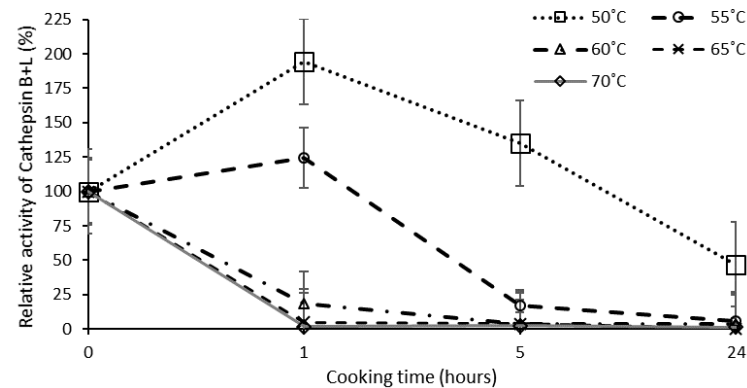


Figure 1

Relative activity of cathepsin B + L in hot boned beef brisket heated at 50 °C (□), 55 °C (○), 60 °C (Δ), 65 °C (∩) and 70 °C (◇) for 1, 5 and 24 hours.

Notes