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# Endpoint Temperature Influences Sarcoplasmic Proteome Profile of Cooked Beef *Longissimus Lumborum*

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## Objectives

Cooking ensures safety and enhances the palatability attributes of meat. Denaturation of myoglobin results in the dull-brown color of cooked meats. The denaturation of sarcoplasmic proteins is influenced by the degree of heat treatment, and their solubility is decreased with an increase in the endpoint cooking temperature. While previous studies examined the relationship between myoglobin denaturation, cooked color, and internal temperature in beef, investigations are yet to be undertaken to characterize the association between endpoint temperature, sarcoplasmic proteome, and color attributes in cooked steaks. Therefore, the objective of the present study was to examine the influence of endpoint cooking temperature (60 and 71°C) on sarcoplasmic proteome and internal color of beef longissimus lumborum (LL) steaks.

## Materials and Methods

Eight ($n$ = 8) beef LL muscles (14 d postmortem; USDA Choice) were obtained from a commercial packing plant. Two 2.5-cm thick steaks were fabricated from the center of the muscles and were cooked to internal endpoint temperature of 60°C (C-60) or 71°C (C-71) in a clam-shell grill. Cooked steaks were immediately cooled in slushed ice, sliced parallel to the grilled surface, and internal redness ($a^*$ value) and color stability (R630/580) were evaluated instrumentally. Sarcoplasmic proteome from the interiors of the cooked steaks was analyzed using 2-dimensional electrophoresis, and the gel images were digitally analyzed. The protein spots exhibiting more than 2.5-fold intensity differences ($P < 0.05$) between C-60 and C-71 were subjected to in-gel tryptic digestion and were identified by tandem mass spectrometry.

## Results

The C-60 steaks demonstrated greater ($P < 0.05$) $a^*$ and R630/580 than their C-71 counterparts. Seven differentially abundant proteins were identified and were over-abundant ($P < 0.05$) in C-60 compared to C-71. The differentially abundant proteins belong to 6 functional groups, i.e., transport proteins (serum albumin and hemoglobin), energy metabolism (adenylate kinase isoenzyme 1), chaperones (heat shock protein β-1), antioxidant (thioredoxin-dependent peroxide reductase), glycolytic enzymes (fructose-bisphosphate aldolase B), and protease (cytosol aminopeptidase).

## Conclusion

The findings indicated that the endpoint cooking temperature influences the internal cooked color and the sarcoplasmic proteome profile of beef LL steaks. The overabundant proteins in steaks cooked to 60°C may be utilized as potential biomarkers for undercooked beef, which is a source for foodborne infections.