



Effects of Display Time on Mitochondrial and Cytochrome C Content in Beef Longissimus and Psoas Muscles

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Objectives

Beef discoloration is muscle-specific and it depends on inherent biochemical properties. Longissimus is classified as a color-stable muscle while psoas is a color-labile. Various studies have characterized the role of mitochondria in beef color. However, limited studies have determined the effects of display time on mitochondrial and cytochrome C content. Therefore, the objective of this study was to determine the effects of display time on mitochondrial and cytochrome C content in beef longissimus and psoas muscles.

Materials and Methods

Longissimus lumborum (LL, $n = 10$) and psoas major (PM, $n = 10$) muscles were obtained 3 d postmortem from a packing facility. Steaks were cut from both muscles, packaged in PVC, and displayed for 7 d under retail conditions. Surface color, nitric oxide metmyoglobin reducing activity, oxygen consumption, mitochondrial content, cytochrome c content, and oxidation reduction potential were measured during display. Surface color (a^* value) was determined daily using a Hunter Lab Miniscan EZ spectrophotometer. Mitochondrial content was determined as total mitochondrial yield. Sandwich ELISA was used to determine cytochrome c content in muscles and a Redox SYS oxidation reduction potential (ORP)

analyzer was used to measure ORP. Oxidation reduction potential, mitochondrial and cytochrome c content were determined on d 0, 3, and 7. A split plot design was used to analyze mitochondrial and cytochrome C content. The whole plot consisted of muscle (LL or PM) and the sub-plot unit of steak was assigned to day of display within a whole muscle. Fixed effects included muscle, display time, and their interaction. The data were analyzed using the Mixed Procedure of SAS (SAS Inst. Inc., Cary, NC) and considered significant at $P < 0.05$.

Results

Psoas major had shorter color stability, lower MRA, and OCR by d 7 than LL ($P < 0.05$). On d 0, PM had greater ($P < 0.05$) mitochondrial content than LL. However, by d 7, PM had a lower ($P < 0.05$) mitochondrial content and greater cytochrome C level in sarcoplasm than LL. Oxidative stress was greater ($P < 0.05$) in PM muscle than LL.

Conclusion

Decrease in mitochondria content and greater cytochrome C levels indicate that PM muscles had greater postmortem changes than LL. Understanding the muscle specific biochemical changes will help to formulate postharvest processing techniques to minimize losses due to beef discoloration.