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Impact of Light Emitting Diodes (Led) On Beef Steaks from the Triceps Brachii; a Color Labile Muscle

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Objectives

Color of fresh beef is one of the economically important attributes and purchasing decision factors for consumers in a retail setting. The objectives of this study were to evaluate the impact of modern light sources on surface color and lipid oxidation of fresh beef steaks from the *Triceps brachii* (TB) over retail display time.

Materials and Methods

Steaks from the TB [low oxidative and color stabilities] (n = 20) were packaged on Styrofoam trays and overwrapped with oxygen permeable polyvinyl chloride. Steaks were then assigned to 1 of 3 lighting treatments (High UV fluorescent [HFLO], low UV fluorescent [FLO], and light emitting diode [LED]) within temperature controlled deli cases between 2 to 3°C. Steaks were removed on retail display d 1, 3, 5, and 7 for objective color determination, surface myoglobin redox forms, metmyoglobin reducing activity, and lipid oxidation levels. Objective color (L^*, a^*, and b^*) values were determined utilizing a Hunter MiniScan. Following objective color determination, relative proportions of myoglobin redox forms were determined as a measure of myoglobin oxidation. Total myoglobin concentration and metmyoglobin reducing activity (MRA) assays were performed on fresh meat samples. In addition, lipid oxidation was determined by quantification of thiobarbituric acid reactive substances (TBARS). Statistical analysis was analyzed using the GLIMMIX function of SAS (SAS Inst. Inc., Cary, NC).

Results

Objective color measurements for redness, as indicated by a* values decreased daily ($P < 0.05$) for steaks produced from the TB with values of 22.14, 17.73, 15.72, and 13.49 for d 1, 3, 5, and 7, respectively. Light treatment also changed a* values for steaks with HFLO treated steaks having higher ($P < 0.05$) a* values than steaks treated with both FLO and LED light sources. Surface oxymyoglobin (MbO_2) contents were higher ($P < 0.05$) for steaks from the TB treated with HFLO lights than those treated with FLO (d 3 and 7) or LED (d 5 and 7) lights. Steaks treated with HFLO lights had less ($P < 0.05$) metmyoglobin (MMb) than those treated with both FLO and LED lights on retail display d 5 and 7. On d 7 of retail display, steaks treated with HFLO light sources had lower ($P < 0.05$) TBARS values than those treated with FLO or LED light sources.

Conclusion

Data indicate that muscles with low oxidative and color stabilities, such as TB, are impacted by modern lighting technologies such as LED light sources.