2019 Reciprocal Meat Conference– Meat and Poultry Safety

Meat and Muscle Biology™

Does Treating Beef Subprimals with UV-Light Reduce Pathogens and Impact Quality?

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Keywords: beef, food safety, intervention, pulsed-light UV
Meat and Muscle Biology 3(2):133

Objectives

To evaluate reduction of pathogens and impact on quality parameters of beef strip loins treated with pulsed-UV light.

Materials and Methods

Inoculum was prepared as a cocktail of three non-pathogenic, rifampicin-resistant *E. coli* Biotype I surrogates. Strip loins were halved, inoculated, individually vacuum packaged, and assigned to one of three pulsed-light UV treatments: (1) light height 5 cm, belt speed 15 Hz; (2) light height 28 cm, belt speed 15 Hz; and (3) light height 28 cm, belt speed 25 Hz. Microbiological samples were obtained and enumerated pre- and post-treatment (n = 90; 3 UV treatments × 5 strip loin halves per treatment × 2 sampling times (pre/post treatment) × 3 replications).

To evaluate quality parameters, a control group was added to the three UV treatments. Uninoculated strip loin halves (n = 48) were fabricated, packaged, and assigned (n = 12 strip loins halves per treatment) to one of the four treatment groups. Within each group, n = 3 strip loin halves were assigned a storage time (0, 7, 14, or 21 d). After treatment, three steaks from each strip loin half (approximately 2.54-cm thick; n = 192 total steaks) were cut and individually packaged for analyses: (1) trained aroma and color panel, (2) steak surface pH, purge pH, purge quantification, and objective color, and (3) aerobic plate counts.

Data were analyzed using JMP Pro (SAS Institute Inc., Cary, NC). The fit model function was used for analysis of variance, and least squares means comparisons were conducted when appropriate using Student's t test with an α-level 0.05.

Results

No differences were seen ($P > 0.05$) in reductions of *E. coli* surrogates among the three UV treatments, with all reductions less than 1-log. No differences ($P > 0.05$) in aroma scores among treatment groups were noted, although differences in aroma attribute scores occurred between aging times. Panelists scored samples highest ($P < 0.001$) for bloody/serumy on d 0 than any other aging time. Conversely, sour dairy and spoiled intensified over time with d 21 samples receiving the highest scores ($P < 0.001$). Although trained panelists' responses for lean color score did not differ ($P = 0.277$) among UV treatments, scores for percent discoloration did ($P = 0.014$). Notably, percent discoloration scores for d 0 were statistically higher than other aging times, meaning that discoloration diminished as aging continued. No statistical differences were identified for L^*, a^*, or b^* values across UV treatments. Between aging times, differences were seen ($P < 0.001$) for a^* and b^* values, with d 0 having the lowest values for both. For purge and pH, the surface pH of steaks was higher on Days 0 and 7 and began to decrease, showing statistical similarities on Days 14 and 21. The amount of purge (g) steadily increased as steaks aged. APC counts were not found to differ due to UV treatment but generally tended to increase as storage times lengthened.

Conclusion

Pulsed-UV light on chilled subprimals resulted in low microbial reductions, however, this technology could be beneficial if used in addition to other antimicrobial interventions. Initial discoloration was identified but improved as steaks aged. While APCs tended to increase over the course of storage, as did purge, no differences due to UV treatments were seen. Further research is warranted to determine if different treatment parameters would result in greater microbial reductions.