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Lipid Oxidation of American Grain-Fed and New Zealand Grass-Fed Strip Loins Varying in Aging Time and Marbling Level

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Objectives

Grass-fed beef imported from New Zealand has been known to be lower in fat content and undergo a longer wet-aging period during transport compared to domestically produced beef. The effects of wet-aging time on oxidative metrics in highly marbled grass-fed beef are not fully known at this time. Therefore, the objective of this research was to assess the lipid stability of grass-fed strip loin steaks in comparison to grain-fed strip loin steaks from 5 different United States Department of Agriculture (USDA) quality grades, wet-aged for 7, 21, and 42 d.

Materials and Methods

Beef strip loins ($n = 200$) representing 2 fed cattle types ($n = 100$ /finishing type: grass-finished and grain-finished) and 5 different USDA quality grades ($n = 20$ per quality grade: USDA Standard, Select, Low Choice, "Top" Choice: High and Average Choice, and Prime) were acquired from beef processing facilities in New Zealand (grass-fed) and Nebraska (grain-fed). Each strip loin was equally portioned into thirds, vacuum packaged, and assigned to 1 of 3 wet aging periods (7, 21, or 42 d). After the appropriate aging period, portions ($n = 600$) were frozen and stored at the Gordon W. Davis Meat Science Laboratory until further fabrication. Frozen strip loin portions were cut into 2.54 cm steaks using a band saw. Prior to cutting portions into steaks, steak samples for thiobarbituric acid-reactive substances (TBARS) were taken from the anterior and posterior face steaks of each strip loin portion. The steak pieces for TBARS analysis were vacuum packaged and frozen until homog-

enization. Samples were thawed for 12 to 24 h, trimmed of subcutaneous fat and connective tissue, frozen in liquid nitrogen and homogenized for TBARS analysis. The amount of TBARS was determined to estimate lipid oxidation, and results were reported in mg malondialdehyde/kg sample. Statistical analyses were conducted using the procedures of SAS (Version 9.3; SAS Inst. Inc., Cary, NC). Treatment comparisons were tested for significance using PROC GLIMMIX with $\alpha = 0.05$.

Results

A diet by age time interaction was found for TBARS values ($P < 0.05$). No difference was found between grass-fed 7, 21, or 42 d treatments for TBARS ($P > 0.05$), indicating prolonged aging periods had no detrimental effect on grass-fed strip loins. Whereas, grain-finished strip loins aged 42 d had greater TBARS values than shorter aged product ($P < 0.05$). All grain-finished strip loins, regardless of age, had higher TBARS values than all grass-finished strip loins ($P < 0.05$). Finally, no difference was found between quality grades for TBARS ($P > 0.05$). The TBARS values for all samples were low, ranging from USDA Standard at 0.098 mg/kg to USDA Low Choice at 0.111 mg/kg.

Conclusion

In conclusion, all steaks had very low levels of lipid oxidation, due to aging in a vacuum package. Although lipid oxidation tended to increase with longer periods of wet-aging time, steaks from grass-fed cattle were less susceptible to lipid oxidation than grain-fed cattle.