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Quality and Shelf Life of Ground Beef from Cattle Fed Distillers Grains Manufactured to Contain Different Amounts of Oil

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Objectives

Ethanol processors have begun removing a portion of the free oil from distillers grains during the manufacturing process. Therefore the purpose of this study was to determine the effect of feeding modified distillers grains (MDGS) containing different amounts of oil on the fatty acid content and quality characteristics of raw and cooked ground beef.

Materials and Methods

Steers ($n = 256$) were finished (134 d) on 1 of 4 diets: 1) corn control, 2) 40% full-fat MDGS, 3) 40% de-oiled MDGS, or 4) 40% de-oiled MDGS with oil added back in proportion to the oil removed during the de-oiling process. From each pen ($N = 32$; 8 pens per diet with 8 steers per pen), the shoulder clod from 1 USDA low Choice carcass was collected. Shoulder clods were stored at 4°C until processing. On d 14 postmortem, about 100 g of lean tissue (*triceps brachii*) and 30 g of subcutaneous fat was collected from the ventral end of each shoulder clod for fatty acid analysis and the remaining portion was ground. A ground composite sample was collected for fatty acid analysis. Raw patties (113 g) and cooked beef links (containing 0.75% salt and 0.25% sodium phosphate) were manufactured from each ground clod. The raw patties covered in oxygen permeable film were placed in a simulated retail display for 7 d at 4°C. The raw patties were analyzed for objective color (L^* , a^* , b^* ; Minolta CR-400), percentage discoloration by a 5-person panel, and lipid oxidation by the thiobarbituric acid reactive substances (TBARS) protocol during retail

display storage. Cooked beef links were stored at 4°C for 18 d and 0°C for 196 d, and were analyzed for lipid oxidation throughout storage. Data were analyzed for main effects of diet, and when appropriate, data were analyzed for main effects of diet, time, and their interaction using GLIMMIX procedure of SAS (v.9.4; SAS Inst. Inc., Cary, NC). Storage time was considered a repeated measure. When significant effects were identified ($P \leq 0.05$), LS means separation was conducted using a Tukey adjustment.

Results

Inclusion of any modified distillers grains increased the content of C18:2 in lean, subcutaneous fat, and ground composite samples, and the concentration of polyunsaturated fatty acids (PUFA) in subcutaneous fat and composite samples ($P \leq 0.01$). Diet did not impact objective color measures ($P = 0.827$), discoloration ($P = 0.872$), or lipid oxidation in raw beef patties ($P = 0.289$). Lipid oxidation and discoloration of raw patties increased throughout simulated retail display ($P < 0.001$). Similarly, finishing diet had no effect on lipid oxidation of cooked beef links in refrigerated ($P = 0.342$) or frozen storage ($P = 0.948$) but lipid oxidation did increase with increased refrigerated or frozen storage time ($P < 0.001$).

Conclusion

Feeding modified distillers grains manufactured to contain different amounts of lipid content to cattle increased the amount of C18:2 and PUFA in beef but did not have negative effects on the quality and shelf life of raw ground beef patties or cooked beef links.