Lipid Oxidation in Cooked Ground Beef Links from Cattle Fed Distillers Grains in Different Phases of Production

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Summary

Ground beef links from cattle fed high or low levels of distillers grains during backgrounding and Sweet Bran® or modified wet distillers grains in finishing diets were compared to analyze oxidation over time. Ready-to-eat beef links from cattle fed 5 lb/head/day (DM basis) of wet distillers grains during backgrounding had greater oxidative rancidity with extended storage than those from cattle fed 2 lb/head/day (DM basis). Beef links from cattle finished with wet distillers grains oxidized more rapidly than those fed Sweet Bran. Therefore, cooked beef from cattle fed distillers grains during either phase of production (backgrounding or finishing) showed greater oxidative rancidity as well as an increase rate of oxidation.

Introduction

As a result of the rapid growth of the ethanol industry, many cattle producers include ethanol byproducts in cattle diets. Previous research has shown that cattle fed wet distillers grains (WDGS) have an increase in polyunsaturated fatty acids, which may decrease oxidative stability (*2009 Nebraska Beef Cattle Report*, pp. 107-109 and 110-112). The polyunsaturated fatty acids will readily undergo free-radical chain reactions resulting in deterioration of the lipid. Lipid oxidation and off-flavor development after cooking is accelerated due to the release of free and heme-iron from myoglobin during cooking. While much research has been conducted on fresh beef characteristics from cattle fed ethanol co-products, the impact on cooked beef products has not been studied. Therefore, the objective of this trial was to evaluate the impact of feeding modified wet distillers grains during two production phases on lipid oxidation in ready-to-eat beef.

Procedure

Heifers were randomly assigned to a dietary treatment in a 2 X 2 design factorial that included 2 or 5 lb/head/day (DM basis) supplementation of wet distillers grains during the winter backgrounding phase and finished on a corn based diet with 40% dietary inclusion (DM basis) of either Sweet Bran or modified wet distillers grains. During the summer months, all cattle were supplemented with modified wet distillers grains at a rate of 0.6% of BW. A total of 16 USDA Choice clods, four carcasses from each dietary treatment group, were collected. Each clod was independently ground 14 days post-harvest. Beef (with no fat content formulation) and non-meat ingredients, 0.75% sodium chloride and 0.25% sodium phosphate, were mixed for one minute and the mixture was stuffed into skinless links using a piston stuffer. Links were placed in individual foil trays for each clod and cooked in a smokehouse to an internal temperature of 160°F. The links were placed in zip-top bags with the presence of oxygen and placed in refrigerated dark storage. Lipid oxidation was evaluated on days 0, 3, 6, 9, 12, 15, and 18 using the thiobarbituric acid reactive substances (TBARS) analysis. Data were analyzed as a 2 X 2 factorial with repeated measures (day) using the PROC GLIMMIX procedure of SAS (SAS Institute, Inc., Cary, N.C.).

Results

Significant winter backgrounding diet × day ($P = 0.008$) and finishing diet × day ($P = 0.02$) interactions were identified. During winter backgrounding, there was no difference ($P > 0.05$) in lipid oxidation between cattle fed 2 lb/head/day or 5 lb/head/day (DM basis) of modified wet distillers grains on days 0, 3, and 6 of refrigerated storage ($P = 0.99$, 0.88, and 0.58, respectively; Figure 1).

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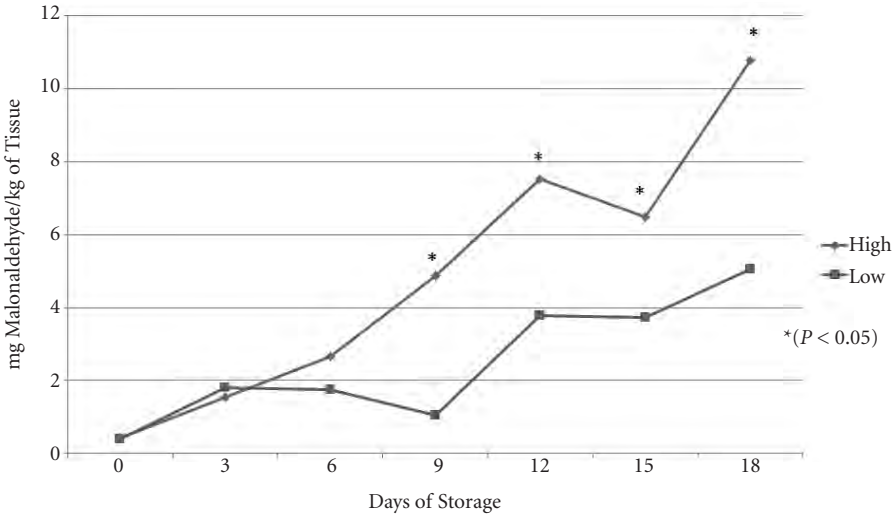

Figure 1. Effect of supplementation level of wet distillers grains (2 or 5 lb/head/day DM basis) during backgrounding on lipid oxidation (mg of malonaldehyde/kg of tissue) in cooked ground beef links.

However, cattle fed 5 lb of wet distillers grains during backgrounding had greater lipid oxidation than cattle fed 2 lb of wet distillers grains for days 9, 12, 15, and 18 ($P = 0.02$, 0.02, 0.09, and 0.001, respectively). In finishing, there was a linear increase in lipid oxidation for days 0, 3, 6, 9, and 12 for cattle fed modified wet distillers grains (Figure 2) and had great lipid oxidation than cattle fed Sweet Bran on days 6 and 9 ($P = 0.05$ and 0.02, respectively). There was little increase in lipid oxidation for cattle fed Sweet Bran during finishing for days 0, 3, 6, and 9. On days 12, 15, and 18, the oxidation of cattle fed distillers grains and cattle fed sweet bran were similar ($P = 0.55$, 0.62, and 0.09, respectively). These findings suggest that feeding distillers grains during either production phase (backgrounding or finishing) increases lipid oxidation and decreases shelf life of ready-to-eat beef products.

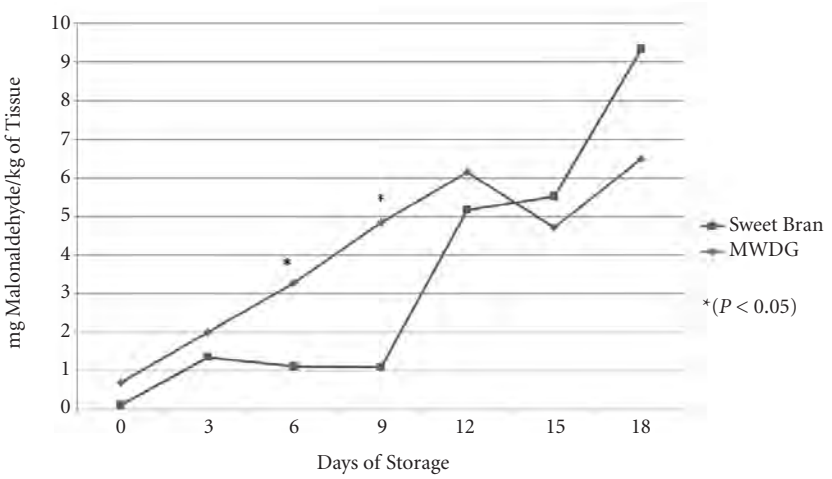

Figure 2. Effect of feeding Sweet Bran or modified wet distillers grains during finishing on lipid oxidation (mg of malonaldehyde/kg of tissue) in cooked ground beef links.

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