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Ground Beef from Electrically Stimulated and Pre-rigor Processed Carcasses

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Summary

Ground beef from electrically stimulated and/or pre-rigor processed carcasses was equivalent to conventional ground beef in texture, palatability, and frozen storage stability, but lost more juice when vacuum-stored, had 2% more total cooking losses from patties, and 1 day less shelflife during display.

Introduction

Ground beef constitutes about 50% of all beef consumed, so we investigated effects of the accelerated processing methods of electrical stimulation and pre-rigor processing, which have energy saving potential for steak and roast meats, on ground meats.

Experimental Procedure

Our ground beef samples were removed from the chuck (clod) and shank areas of 46 large- and small-type cattle fed finishing rations 112 to 154 days. Half of the carcass sides were electrically stimulated (2 minutes continuous, AC, 60 Hz, 440 volts, 6 amps) 1 hr postmortem, and all sides except the control group were pre-rigor processed 2 hr postmortem. Fat content of the ground meat was 22 to 24%. We evaluated packages and patties from each treatment for color, palatability, and storage properties. Treatments were:

- 1: Control, conventional processing (no electrical stimulation)
Trim removed 48 hr postmortem, then ground through $\frac{1}{2}$ -inch plate
Vacuum-stored 6 days
Final-grind, $\frac{1}{8}$ -inch plate
- 2: Electrically stimulated sides
Trim removed 2 hr postmortem
Vacuum-stored 6 days
Final-grind through $\frac{1}{2}$ - and $\frac{1}{8}$ -inch plates
- 3: No electrical stimulation
Trim removed 2 hr postmortem, then ground through $\frac{1}{2}$ -inch plate
Vacuum-stored 6 days
Final-grind, $\frac{1}{8}$ -inch plate
- 4: Electrically stimulated sides
Trim removed 2 hr postmortem, then ground through $\frac{1}{2}$ -inch plate
Vacuum-stored 6 days
Final-grind, $\frac{1}{8}$ -inch plate

Results and Discussion

Shear and Taste Panel Traits: Lee-Kramer shear values and scores for cooked patty tenderness, juiciness, flavor, crumbliness, and rubberyness were similar for all treatments. Ground beef textural properties were not adversely affected.

Frozen Storage Stability: Measures of rancidity (thiobarbituric acid method) after 0, 3, 6, 9, and 12 months' frozen storage were similar for all treatments.

Display Color Stability: Packages of ground beef from the control had the brightest red color scores initially and through 4 days of display. Color stabilities of other treatments were similar, but their color scores were slightly, and consistently, lower than the controls, which had about 1 day longer display life.

Juice Loss in Vacuum Bags: Treatments 2, 3, and 4 had twice as much free juice in vacuum-stored bags of coarse ground meat or trim than the control group. Apparently this juice is squeezed out of pre-rigor meat while it undergoes rigor, but can be re-incorporated into the ground product during the final-grinding process. Electrical stimulation of sides increased free juice accumulation, probably due to a more rapid pH decline.

Total Cooking Losses in Patties: In general, treatments 2, 3, and 4 had about 2% higher cooking losses in both 1/8 and 1/4 pound patties than did control group patties. However, these losses did not lower taste panel scores for juiciness.

Hot Processing of Beef Carcasses

When carcasses are chilled before they are cut up, considerable refrigeration energy is used to cool the bone and excess fat. Processing carcasses before chilling reduces the energy required and operating cost by \$2.75 per cut carcass. In addition, shrink due to moisture loss is lowered.

Hot processing fits particularly well into boxed beef operations. See the articles on hot processing for further details.