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Vacuum-Packaged Versus Conventionally  
Packaged Ground Beef: The Influence of  
Packaging on Consumer Acceptance and  
Flavor Characteristics

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Summary

Vacuum-packaged ground beef was compared to a conventionally packaged (polyvinyl chloride) product to determine consumer flavor and aroma preferences. In addition, flavor characteristics were described and quantified by a trained panel. Consumer panels slightly preferred the cooked beef flavor of the conventionally packaged product and the raw aroma of the vacuum-packaged product. Conventionally packaged samples displayed for 3 days and then cooked were slightly less beefy, less fresh, more stale, slightly less bloody/serummy, slightly less sour, and had less of a metallic mouth feel than vacuum-packaged samples stored 12 days and cooked. Throughout display, flavor of the vacuum-packaged samples was more consistent than that of the conventionally packaged samples. Based on flavor and aroma characteristics, vacuum-packaged ground beef should compete favorably in the marketplace.

Introduction

Vacuum packaging (VP) of beef offers many potential benefits to both the consumer and the processor. VP can improve product acceptability and consumer perception of freshness and quality, extend display life, reduce product loss, and lower transportation and delivery costs. These benefits are due to slower growth of spoilage bacteria and the exclusion of air, which slows the formation of the undesirable brown color. However, it is not well known if flavor differences resulting from vacuum packaging affect consumer preference.

This study attempted first, to determine consumer flavor and aroma preferences and second, to develop descriptors and describe the cooked flavor of VP ground beef and ground beef packaged conventionally in polyvinyl chloride (PVC).

Experimental Procedures

Beef trim was obtained within 72 hours postmortem from the Kansas State University meat laboratory. Conventionally packaged PVC samples were ground, packaged, and displayed 3 days. VP samples were ground, packaged, and displayed 12 days. Once packaged, samples were displayed under continuous natural fluorescent lighting in a commercial type display case. Samples contained approximately 18% fat. Uniform patties of unseasoned ground beef were pan broiled in an electric skillet and served immediately for flavor testing.

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Fifty-eight untrained judges (KSU students, staff, and faculty) participated in a triangle test. Each panelist was given three unidentified samples, two alike and one different (for example, 2 PVC and 1 VP). Panelists were asked to identify the "different" sample on the basis of cooked beef flavor.

Fifty-three untrained judges participated in a preference test. First, each judge was given two unidentified samples (1 PVC and 1 VP). Each panelist was asked to score his/her like or dislike of the beef flavor of each sample (1=dislike extremely, 8=like extremely). Then, each judge sniffed two unidentified raw samples (1 PVC and 1 VP) and indicated (yes or no) if they would cook the product based on its raw aroma.

A trained flavor-profile panel was used to evaluate the flavors associated with cooked VP and PVC ground beef. Samples were evaluated at selected times during display to evaluate the effect of display time on flavor profiles. Each panelist was given several bites of each sample and asked to indicate the intensity of the beefy, fat, fresh, stale/off, bloody/serummy, sweet, bitter, and salty tastes; oily, metallic, and astringent mouthfeels; and oily/fatty, beefy, stale, and astringent aftertastes present in each sample. After each sample was evaluated, the panelists discussed their scoring, providing a word description to supplement the scale score.

### Results and Discussion

Consumer taste panels detected a difference ( $P < .01$ ) in the cooked beef flavor between VP and PVC-packaged samples. Preference evaluation indicated that panelists liked the flavor of the PVC-packaged product over the VP product, but by only a small amount. These consumers liked both products. Based on raw aroma, these consumers would be more likely to cook the VP product.

Throughout display, the flavor of the VP samples was more consistent than that of the PVC samples. After 3 days of display, cooked PVC samples were slightly less beefy, less fresh, more stale, slightly less bloody/serummy, slightly less sour, and had less of a metallic feeling in the mouth than 12-day-old, cooked VP samples. Three-day-old PVC samples had no lingering metallic or astringent feelings in the mouth as did the VP samples. Fatty, sweet, and salty tastes; oily and astringent mouthfeelings; and lingering oily, beefy, and stale tastes were similar in both products.

It appears that VP ground beef has a more stable flavor profile, but one that is different from that of the PVC-packaged ground beef to which consumers are accustomed. Although consumers detected flavor and aroma preference differences, these differences were small. Based on flavor and aroma characteristics, VP ground beef should compete favorably in the marketplace.