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A. Lobaton-Sulabo

K. Uppal

Kelly J.K. Getty

Elizabeth A.E. Boyle

See next page for additional authors

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Abstract
Following several outbreaks involving Listeria monocytogenes in ready-to-eat meat and poultry products, the United States Department of Agriculture Food Safety and Inspection Service required that processors of these products implement post-processing intervention strategies for controlling L. monocytogenes. The USDA defines a postlethality treatment as a process that reduces L. monocytogenes by at least 1 log. Research has shown that packaging can generate a 1 log L. monocytogenes reduction following 1 or more weeks of storage at room temperature. The objective of our study was to determine the effect of packaging system and storage time on reducing L. monocytogenes in shelf-stable kippered beef steak.

Keywords
Cattlemen's Day, 2010; Kansas Agricultural Experiment Station contribution; no. 10-170-S; Report of progress (Kansas State University. Agricultural Experiment Station and Cooperative Extension Service); 1029; Beef Cattle Research, 2010 is known as Cattlemen's Day, 2010; Beef; Listeria monocytogenes; Steaks; Heat seal; Nitrogen; Vacuum package

Authors
A. Lobaton-Sulabo, K. Uppal, Kelly J.K. Getty, Elizabeth A.E. Boyle, N. Harper, B. Barry, and James J. Higgins

Packaging Systems and Storage Times Serve as Post-Lethality Treatments for *Listeria monocytogenes* on Kippered Beef Steaks

A. Lobaton-Sulabo, K. Uppal[1], K. Getty, E. Boyle, N. Harper, B. Barry[1], and J. Higgins

Introduction

Following several outbreaks involving *Listeria monocytogenes* in ready-to-eat meat and poultry products, the United States Department of Agriculture Food Safety and Inspection Service required that processors of these products implement post-processing intervention strategies for controlling *L. monocytogenes*. The USDA defines a post-lethality treatment as a process that reduces *L. monocytogenes* by at least 1 log. Research has shown that packaging can generate a 1 log *L. monocytogenes* reduction following 1 or more weeks of storage at room temperature. The objective of our study was to determine the effect of packaging system and storage time on reducing *L. monocytogenes* in shelf-stable kippered beef steak.

Experimental Procedures

Kippered beef steaks were obtained from a commercial supplier. Steak strips were dipped in a five-strain *L. monocytogenes* cocktail for 1 minute and then allowed to dry until the water activity of the inoculated product was roughly equivalent to the starting water activity of 0.83. Inoculated samples were then packaged in one of four treatments: heat sealed, heat sealed with oxygen scavenger, nitrogen flushed with oxygen scavenger, and vacuum. Packaged inoculated treatments were stored at room temperature and evaluated for *L. monocytogenes* after 0, 24, 48, and 72 hours. Three replications were conducted for this study, and each replication consisted of duplicate samples.

Results and Discussion

A 1 log reduction of *L. monocytogenes* was observed after 24 hours for all packaging treatments except heat sealed with oxygen scavenger, which had only a 0.6 log reduction (Figure 1). After 48 hours of storage, *L. monocytogenes* reductions were inconsistent for all treatments and ranged from <1.0 log reduction for the heat sealed with oxygen scavenger, nitrogen flushed with oxygen scavenger, and vacuum packaging treatments to >1.5 log reduction for the heat sealed treatment. After 72 hours of ambient temperature storage, log reductions for all packaging treatments ranged from 1.7 to 2.4.

Implications

Kippered beef steak processors could use a storage time of 24 hours prior to shipping in combination with heat sealed, nitrogen flushed with oxygen scavenger, or vacuum packaging treatments to reduce *L. monocytogenes* populations by at least 1 log. However, processors should be encouraged to hold packaged product for a minimum of 72 hours to enhance the margin of safety for *L. monocytogenes* control.

[1] Oberto Sausage Company, Kent, WA.

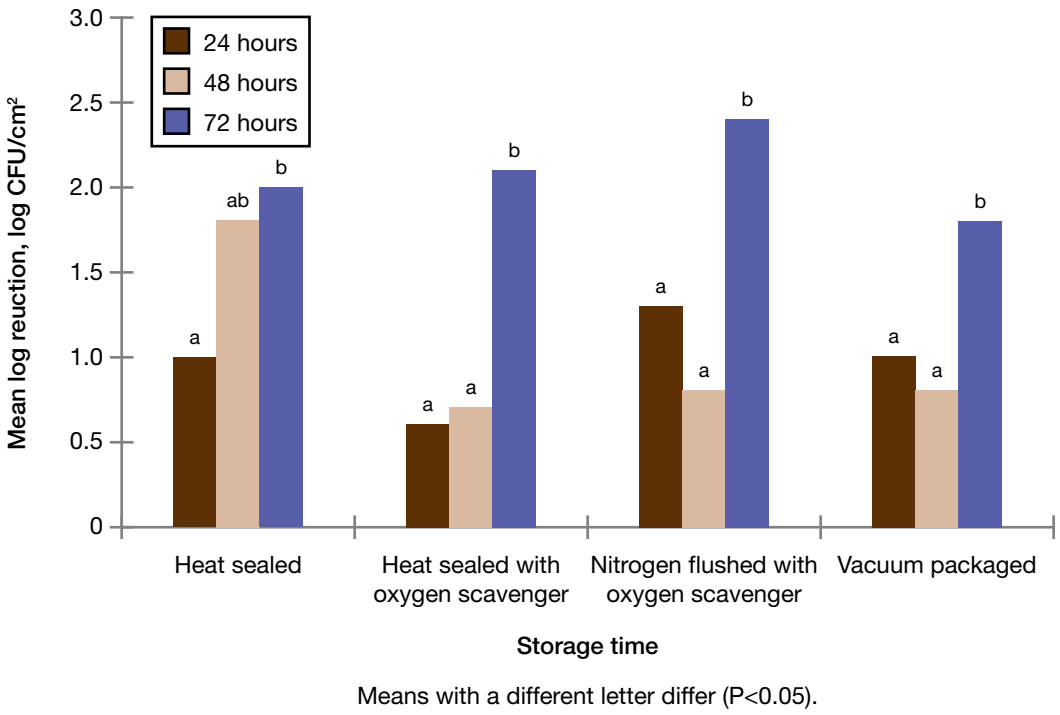

Figure 1. Mean log reductions of *Listeria monocytogenes* on kippered beef steaks packaged in different packaging systems and stored at room temperature.