CENTER FOR MEAT PROCESS VALIDATION

Processing and Pre-shipment Room Temperature-Storage of Beef Jerky

**Category:** Shelf-stable Ready-To-Eat meat products  
**USDA HACCP Category:** Heat treated, shelf-stable  
**Processing:** Cooking/drying and pre-shipment storage  
**CCP:** cooking/drying, pre-shipment storage  
**Validates:** Product characteristics ensuring no growth of *Listeria monocytogenes* during normal shelf-life of product; pre-shipment storage conditions resulting in death of *L. monocytogenes*

**CCP:** The USDA final rule addressing the control of *Listeria monocytogenes* on ready-to-eat (RTE) meat and poultry products requires processors of RTE products to take one or more specific steps to ensure the absence of *L. monocytogenes* from their products. In particular, the rule requires processors to adopt one of three designated “Alternatives” to control *L. monocytogenes* on their products. The Alternatives involve varying levels of control and required microbiological testing of food-contact surfaces. In Alternative 1, the processor uses a post-lethality treatment that reduces or eliminates *L. monocytogenes* AND an antimicrobial agent or process that suppresses or limits *L. monocytogenes* growth throughout product shelf-life. In Alternative 2, the processor uses either a post-lethality treatment that reduces or eliminates *L. monocytogenes* OR an antimicrobial agent or process that suppresses or limits *L. monocytogenes* growth throughout product shelf-life. Under Alternative 3, only sanitation measures are relied upon to control *L. monocytogenes*. For beef jerky, the reduction of water activity, accomplished through cooking/drying, could serve as an antimicrobial process by making the finished product unsuitable for *L. monocytogenes* growth. Compliance guidance from USDA has stated that an effective antimicrobial process will allow no more than a 1.0 log increase in *L. monocytogenes* on an RTE product throughout its shelf-life. In addition, short-term pre-shipment storage may achieve sufficient lethality to serve as a post-lethality treatment (reduction in *L. monocytogenes* numbers of at least 1.0 logs).

**Study Design:** Individual pieces of beef jerky were inoculated with a 5-strain cocktail of *L. monocytogenes*, re-packaged under vacuum, and then stored at room temperature (70°F / 21°C) for 4 or 5 weeks. Numbers of *L. monocytogenes* were determined before storage and after 1 and 4 - 5 weeks. 18 types of beef jerky were tested.

**Results and Discussion:** Levels of *L. monocytogenes* on beef jerky with water activity of 0.85 or lower decreased 1.0 – 4.7 log CFU in the first week of storage, with lower levels detected 4 or 5 weeks later. Processing beef jerky to yield water activity of ≤ 0.85, combined with 1 week of 21°C storage, would allow the processor to operate under Alternative 1, with the processing technique as the antimicrobial process and the one-week storage as the post-lethality treatment. Without the pre-shipment room-temperature storage, processors of beef jerky could operate under Alternative 2. **To view a table of results CLICK HERE.**

**Validated Critical Limits** based on study results:
- Processing parameters resulting in a product with water activity of 0.85 or lower, AND
- Pre-shipment storage of at least one week at 70°F or warmer

**A full copy of this research report is available on request.**

For more information on this project or the work of the University of Wisconsin Center for Meat Process Validation contact: Steve Ingham, Extension Food Safety Specialist (608) 265-4801, scingham@wisc.edu or Dennis Buege, Extension Meat Scientist (608) 262-0555, drbuege@ansci.wisc.edu May, 2004
The University of Wisconsin-Madison Center for Meat Process Validation provides science-based HACCP support to small meat processors in meeting state and federal mandates for safe food processing and handling.