CENTER FOR MEAT PROCESS VALIDATION

Slow-Cooking of Ham

Category: Ready-to-Eat meats
USDA HACCP Category: Fully cooked, not shelf stable
Processing: Cooking
CCP: Cooking
Validates: Critical Limits needed to ensure no enterotoxin production by ***Staphylococcus aureus*** on the ham surface or inside the ham during a slow-cooking process

CCP: The United States Department of Agriculture (USDA) has cautioned against slow-cooking of meat such that the interior temperature increases from 50°F (10°C to 130°F (54.4°C) in ≥ 6 h. During one typical commercial ham-smoking process, the ham cold-point is typically between 50 and 130°F for 13 h, but is later heated enough to kill vegetative pathogenic bacteria (far exceeds USDA Appendix A guidelines). Thus, production of heat-stable staphylococcal enterotoxin is the primary biological hazard.

Study Design: Uncooked surface and uncooked ground interior ham were inoculated with a 3-strain ***Staphylococcus aureus*** mixture, exposed to simulated surface and interior slow-cook conditions, respectively, and analyzed periodically for numbers of ***S. aureus*** cells.

Results and Discussion: For the surface and interior conditions, respectively, ***S. aureus*** numbers increased by no more than 0.1 and 0.7 log units. Provided good sanitary conditions prevailed during pumping the hams, this minimal level of growth would not result in production of enterotoxin. Thus, the simulated cooking process can be considered safe.

Validated Critical Limits based on study results:
Ham is pumped with brine to attain

- 18% weight gain
- at least 2.35 sodium lactate,
- at least 0.8% sodium chloride,
- at least 200 ppm sodium nitrite

AND cooked so that the internal temperature is

- between 50 and 93°F for no more than 4 hours
- between 93 and 115°F for no more than 5 hours and
- between 115 and 130°F for no more than 5 hours.

Reference: S.C. Ingham, J.A. Losinski, B.K. Dropp, L.L. Vivio, and D.R. Buege. 2004. Evaluation of *Staphyloccus aureus* growth potential in ham during a slow-cooking process: use of predictions derived from the U.S. Department of Agriculture Pathogen Modeling Program 6.1 Predictive Model and an inoculation study. Journal of Food Protection 67:1512-1516. 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 March, 2005

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.