

Critical Limit Summary: Validating Shelf-Stability of

Vacuum-Packaged RTE Meat Products

Background: Several federal labeling standards exist for composition of ready-to-eat (RTE) meat products. The standards have been used to define product characteristics and have long been assumed to define shelf-stability. However, USDA now requires processors to validate the shelf-stability of RTE products in the Heat Treated, Shelf-Stable HACCP product category, **SEPARATELY FROM THE LABELING STANDARDS**. Under vacuum-packaging conditions, *Staphylococcus aureus* and *Listeria monocytogenes* are the pathogens best able to tolerate reduced water activity and increased salt level. Therefore, if *S. aureus* and *L. monocytogenes* do not grow on a vacuum-packaged RTE product during room-temperature storage, **the product can be considered shelf-stable under those conditions**.

The table below shows combinations of pH and water activity that are supported by scientific studies as preventing growth of *Staphylococcus aureus* and *L. monocytogenes* on vacuum-packaged RTE meat products at room temperature (70°F).

Product Category	pH	Water Activity
Dried Products (beef jerky, beef strips, pemmican)	6.3	0.80
	6.2	0.80
	6.1	0.80
	6.0	0.80
	5.9	0.85
	5.8	0.85
	5.7	0.85
	5.5	0.85
	5.4	0.85
	5.3 and lower	0.85
Semi-dry and dry products (summer sausage, salami, snack sticks) with pH reduced through fermentation or use of encapsulated organic acids	5.3	0.91
	5.2	0.91
	5.1	0.92
	5.0	0.93
	4.9	0.96
	4.8	0.96
	4.7 or lower	0.96

References:

1. Ingham, S.C., D.L. Borneman, C. Ané, and B.H. Ingham. 2010. Predicting growth-no growth of *Listeria monocytogenes* on vacuum-packaged ready-to-eat meats. *J. Food Protection* 73: 708-714.

2. Borneman, D.L., S.C. Ingham, and C. Ane. 2009. Predicting growth – no growth of *Staphylococcus aureus* on vacuum-packaged ready-to-eat meats. *Journal of Food Protection* 72: 539-548.
3. Ingham, S.C., G. Searls, S. Mohanan, and D.R. Buege. 2006. Survival of *Staphylococcus aureus* and *Listeria monocytogenes* on vacuum-packaged beef jerky and related products stored at 21°C. *Journal of Food Protection*. 69: 2263-2267.
4. Ingham, S.C., D.R. Buege, B.K. Dropp, and J.A. Losinski. 2004. Survival of *Listeria monocytogenes* during storage of ready-to-eat meat products processed by drying, fermentation, and/or smoking. *Journal of Food Protection*. 67: 2698-2702.

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