
CRITICAL LIMIT SUMMARY: Controlling *Listeria monocytogenes* on Ready-to-Eat Meat Products by Drying, Fermentation, and/or Smoking

Background: Under the USDA's rule on controlling *Listeria monocytogenes* (Lm) on ready-to-eat (RTE) meat and poultry products, processors of RTE products must take one or more specific steps to ensure the absence of Lm from their products. In particular, the rule requires processors of RTE meat and poultry products to adopt one of three designated "Alternatives" to control Lm on their products. The Alternatives involve varying levels of control and microbiological testing of food-contact surfaces.

In **Alternative 1**, the processor uses a post-lethality treatment that reduces or eliminates Lm **AND** an antimicrobial agent or process that suppresses or limits Lm growth throughout product shelf-life.

In **Alternative 2**, the processor uses either a post-lethality treatment that reduces or eliminates Lm **OR** an antimicrobial agent or process that suppresses or limits Lm growth throughout product shelf-life.

Under **Alternative 3**, only sanitation measures are relied upon to control Lm.

For many RTE products, the reduction of water activity accomplished through cooking/drying, along with the reduction of pH via fermentation or addition of an acidulant, could serve as antimicrobial processes by making the finished product unsuitable for Lm growth. These items could thus fall under **Alternative 2**.

Compliance guidance from USDA has stated that an effective antimicrobial process will allow no more than a 1.0 log increase in Lm on an RTE product throughout its shelf-life. This guidance also summarized scientific studies indicating that Lm will not multiply at a water activity of < 0.92 or a pH of <4.39.

Research Study: Small individual pieces of RTE products were inoculated on the outer surface with a 5-strain cocktail of *L. monocytogenes*, re-packaged under vacuum or air (see chart below), and then stored at 41°F / 5°C or 70°F / 21°C for 5 weeks. Numbers of *L. monocytogenes* were determined before storage and after 1 and either 4, 5, or 11 weeks.

Research Results: The table below shows combinations of pH, % water-phase salt, and water activity that inhibited growth of *Listeria monocytogenes* on ready-to-eat meat products packaged and stored under refrigeration or at room temperature.

Product Category	Packaged Under	Storage Temp (°F)	Product pH	% water-phase salt*	Water activity
Snack Sticks	Vacuum	41	4.8	7.6	0.91
			5.0	5.6	0.95
			5.0	5.9	0.93
Summer Sausage	Vacuum	41	4.7	3.9	0.96
			4.9	5.2	0.95
			4.8	5.0	0.96
		70	4.9	5.2	0.95
			4.8	5.0	0.96
Buffalo/Elk Sausage	Vacuum	41	5.2	6.5	0.95
			5.3	4.5	0.96
		70	5.2	6.5	0.95
			5.3	4.5	0.96
Smoked Cured Beef	Vacuum	41	5.5	2.9	0.96
			5.6	2.5	0.98
Beef Jerky	Vacuum	70	5.6	14.4	0.75
Pork Rinds / Cracklins	Air	70	6.0	56.9	0.29
			6.1	60.7	0.27
			6.1	69.3	0.27
			6.7	69.2	0.28

* Also referred to as brine concentration. To calculate, divide the % salt by the sum of % salt and % water. Multiply the answer by 100.

Validated Critical Limits: If your product has pH, % water-phase salt, and water activity at least as restrictive as the comparable product in the table above then the process used in making the product is an effective antimicrobial process, provided that the product is stored in the same way as described in the table. For example, if your summer sausage has a pH of 4.8, 6.1 % water-phase salt, and water activity of 0.95, then the process used in making the summer sausage would be an effective antimicrobial process for that product stored under vacuum at either 41 or 70°F.

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. For more information contact: Steve Ingham, Extension Food Safety Specialist (608) 265-4801, scingham@wisc.edu August, 2007

