Critical Limit Summary: Validating Shelf-Stability and Prevention of *Staphylococcus aureus* Growth on 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 is now requiring processors to validate the shelf-stability of RTE products in the heat-treated shelf stable product category, **SEPARATELY FROM THE LABELING STANDARDS**. Under vacuum-packaging conditions, *Staphylococcus aureus* is the pathogen best able to tolerate reduced water activity and increased salt level. Therefore, **if** *S. aureus* does not grow on a vacuum-packaged product during room-temperature storage, **that product can be considered shelf-stable under those conditions**.

Research Study: Small individual pieces of RTE products (beef jerky, dried salami, pepperoni, snack sticks and summer sausage) were inoculated with a 3- or 5-strain cocktail of *S. aureus*, re-packaged under vacuum, and then stored at 70°F (21°C) for 4 weeks. Numbers of *S. aureus* were determined before storage and after 1 and 4 weeks.

Research Results:

The table below shows combinations of MPR, pH, % water-phase salt, and water activity that **inhibited growth** of *Staphylococcus aureus* on ready-to-eat meat products packaged and **stored at 70°F (21°C).**

Product Category	moisture:protein ratio (MPR)	pH	% water-phase salt[a]	water activity
Beef Jerky	0.8	6.1	14.2	0.76
	0.7	6.0	15.1	0.79
	0.7	5.3	14.3	0.73
	0.7	6.0	10.6	0.82
	0.6	5.7	17.5	0.75
	0.6	6.4	15.4	0.69
	0.5	5.6	16.9	0.71
	0.4	6.0	17.9	0.72
	0.4	5.7	18.7	0.68
Dried Salami	1.6	4.7	8.1	0.90
	1.5	4.9	9.3	0.88
	1.4	5.1	10.0	0.88
	1.1	5.1	16.3	0.79
	1.0	4.8	17.1	0.76
	1.7	4.9	9.3	0.87
	2.5	4.9	6.5	0.92
	1.6	4.8	8.0	0.87
Pepperoni	0.9	4.9	19.0	0.76
	1.7	4.9	11.6	0.88
	1.5	4.6	13.1	0.86

Product Category	moisture:protein ratio (MPR)	pH	% water-phase salt[a]	water activity
Snack Sticks	2.3	5.0	5.6	0.93
	2.0	4.6	7.1	0.88
	1.9 beef/venison	4.6	3.2	0.93
	1.9	5.0	5.7	0.94
	1.8	5.1	8.0	0.92
	1.7	4.9	9.0	0.85
	1.5	5.3	8.9	0.91
	1.3	5.1	9.7	0.90
Summer Sausage	3.3	4.9	5.9	0.93
	3.2	4.5	5.9	0.94
	3.2	4.8	5.8	0.93
	3.3	4.5	4.3	0.95
	3.2	4.8	5.1	0.94
	3.0	4.9	5.2	0.95
	3.0	4.9	5.6	0.96
	3.0	4.7	5.7	0.93
	3.1	4.9	5.5	0.95
	3.1	4.8	5.8	0.96
	3.1	4.4	4.7	0.96
	3.0	4.9	3.7	0.96
	2.7	4.4	1.5	0.98
	2.9	4.5	4.5	0.96
	2.9	4.8	5.0	0.95
	2.8	4.7	3.9	0.96
	2.8	4.8	4.1	0.97
	2.8	4.9	5.7	0.97
	2.8	4.5	4.9	0.96
	2.8	4.8	4.2	0.96
	2.7	4.5	6.5	0.95
	2.7	4.8	5.4	0.97
	2.7	4.9	5.9	0.96
	2.6	4.5	4.0	0.96
	2.5	4.4	4.0	0.96
	2.5	4.6	3.3	0.97
	2.5	4.7	5.1	0.95
	2.4	4.9	6.5	0.94

[a] 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: Find the category for your product, e.g. dried salami. If your dried salami has pH and either % water-phase salt or water activity **at least as restrictive** as the dried salami results in the table, then your product is shelf-stable **provided** that it is stored at 70ºF or below. For example, if your dried salami has a pH of 4.8 and either 6.5 % water-phase salt or water activity of 0.92, then it can be considered shelf-stable stored under vacuum at 70ºF (cool room temperature).

References

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