

Texas A&M - Reduce *Listeria Monocytogenes* on RTE Products



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SURFACE TREATMENTS OF ACIDIFIED CALCIUM SULFATE REDUCE *LISTERIA MONOCYTOGENES* ON RTE PRODUCTS

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A Mionix Corporation Safe₂O product comprised of acidic calcium sulfate and organic acids significantly reduced the numbers of *Listeria monocytogenes* (*L.m.*) on the surface of hot dogs and prevented re-growth of the pathogen over a 12-week refrigerated storage period both in hot dogs that contained potassium lactate and those that did not.

Two frankfurters formulations were manufactured under commercial processing conditions to contain no (Control) potassium lactate (KL) or 3.3% KL (Purasal; PURAC America, Inc.) (Table 1).

Table 1. Frankfurter formulation ingredients calculated on a raw batch weigh basis

Ingredients	Formulation Treatments	
	Control (%)	Potassium Lactate (%)
Meat Trimmings	74.1	71.7
Lean beef trim (85/15)	38.4	
Pork fat trim (60/40)	35.7	37.2
Non-meat Ingredients	25.9	28.3
Salt*	1.66	
Potassium Lactate (as specified)	-	1.61
Corn Syrup Solids (DE 42)**	1.48	3.3
HMP or HVP	0.74	1.43
Hydrolyzed Beef Stock	0.37	0.72
Sodium Tripolyphosphate	0.33	0.36
Spice/Seasoning	0.37	0.32
Sodium Erythorbate	0.037	0.36
Sodium Nitrite (cure blend)***	0.185	0.036
Added Water	13.3	0.179
10% Added Water (Cook Shrink)	7.4	12.9
		7.2
Total (Batter)	100.0	100.0

*For each percent sodium lactate, sodium chloride was reduced 0.1%, for example: total NaCl was reduced to 2.05% with the addition of 2.0% K Lactate (100% basis) or 3.3% K Lactate (60% basis).

**DE = Dextrose Equivalent

***Cure blend contains 6.25% sodium nitrite bonded to 93.75% salt. Pure nitrite, if used, would be added at 0.011% while the salt would be increased to 1.84%.

After cooking, chilling and peeling, each batch was divided into inoculated (four strain *Listeria monocytogenes* cocktail) and non-inoculated groups. Sixty minutes after surface inoculation, each group was treated 30 sec. with one of four different dips: Control (saline solution), acidified calcium sulfate (Safe₂O or SWPA; Mionix Corporation), 3.3% KL or 3.4% lactic acid (LA). All franks were then vacuum packaged, stored under refrigeration (4.5°C) and evaluated at two-week intervals (0, 2, 4, 6, 8, 10, 12). Proximate composition, process yield, vacuum-package purge, a_w , residual nitrite, sodium content, insoluble components (calcium and phosphorus), pH, objective color, sensory evaluation and microbiological shelf-life (APCs) were determined on non-inoculated samples. *L. monocytogenes* counts were determined on inoculated frankfurters.

Principle Results

Acidified calcium sulfate (SWPA) and lactic acid (LA) dips were effective for reducing surface inoculated *L. monocytogenes* counts on frankfurters. A residual listericidal and listeristatic effect for the SWPA dip was observed when *L. monocytogenes* counts were monitored over storage. The most significant observations were that *L. monocytogenes* numbers were reduced by 5.8 logs on the surface of franks treated with SWPA dip and that after dip treatment *L. monocytogenes* counts remained at the minimum level of detection (1.7 logs) over the 12 week storage period. KL added to the formulation, when compared to franks without KL, did not affect APC or surface inoculated *L. monocytogenes* counts. However, previous research with KL has shown it to be listeristatic against *L. monocytogenes* when contamination is contained within the franks.

The addition of KL to the formulation did not affect fat, protein, ash, process yield, sodium, calcium, phosphorus, vacuum-package purge, pH, a_w , objective color or lactate values; except that percent moisture was slightly lower. Vacuum-package purge was slightly higher in samples treated with the SWPA dip and the pH of the SWPA franks was 0.83 units lower. A slight increase in calcium content of franks dipped with SWPA was detected while only slight changes in surface and internal color were noted for the SWPA dip. Descriptive attribute sensory panel results showed only minimal changes in the sensory properties of the frankfurters containing KL and dipped in antimicrobial solutions.

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The above synopsis is a summary that addresses the fact that *two* different formulations were processed in the study performed for the AMIF -- one without 3.3% potassium lactate (KL) and one with 3.3% KL. For frankfurters with surface inoculated with *L. monocytogenes*, there was no statistical difference between frankfurters treated with KL and ones without KL. Therefore the data was summarized without having to present the supplemental data. Had the inoculation been on the interior of the frank, the KL would have likely shown some listeristatic (suppression of growth) effect against *L. monocytogenes*. **The significant differences observed for surface inoculated *L. monocytogenes* was between the SWPA dipped and franks with or without KL and KL dipped frankfurters.** Since *Listeria* contamination primarily occurs post-cooking (assuming cooked to appropriate temperature) evaluation of surface treatments tend to address the most significant concerns for frank producers.