

# 2004 MAFMA Final Report

Project Title     **Use of Novel Antimicrobial Agents for Control of *L. monocytogenes* on Ready-to Eat Meat Products**

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## 1. Objective Summary

*Listeria monocytogenes* is a deadly pathogen and has emerged as a significant public health risk associated with ready-to-eat (RTE) processed meat products. Use of natural antimicrobial agents such as epsilon polylysine and lauric arginate to achieve lethality and incorporation of bacteriostatic chemical antimicrobials (e.g. buffered sodium citrate) into RTE meat and poultry products holds significant promise for reducing the risk.

## 2. Objective Accomplishments

While we initially proposed using allylthiocyanates and smoke fractions as antimicrobials to provide lethality to *L. monocytogenes*, the industry advisory group suggested that we evaluate more promising antimicrobials epsilon polylysine and lauric arginate to provide lethality and incorporate bacteriostatic agents, buffered sodium citrate and sodium lactate in combination with sodium diacetate. The later antimicrobials are extensively used in the industry to control *L. monocytogenes* growth on RTE meat and poultry products.

Our research has shown that surface application of Lauric arginate and Epsilon polylysine resulted in a 2.98 and 1.51 log CFU/cm<sup>2</sup> reduction in *L. monocytogenes* on the surface of the frankfurters. Incorporation of buffered sodium citrate and sodium lactate in combination with sodium diacetate resulted in inhibition of *L. monocytogenes*, with 4.75 and > 6 weeks required for a 2 log growth in the pathogen.

Combining buffered sodium citrate (with sodium diacetate) with surface application of lauric arginate resulted in 2.98 log CFU/cm<sup>2</sup> reduction in *L. monocytogenes*, with inhibition of the pathogen with > 6 weeks required to reach > 2 log growth of the pathogen. Similar results were observed with other combinations of antimicrobial agent and the lethality systems observed.

## 3. Unexpected findings, if any

While we predicted initial reductions in *L. monocytogenes*, we expected the growth of the pathogen will also be inhibited with the application of the lethality systems (LAE and EPL). Our observations indicated that the maximum growth rate for the pathogen in control product that received the lethality applications were similar, although the initial populations and the lag phase were different.

#### **4. Practical Impacts of research efforts**

##### **a. Short Term Impacts**

Ready to Eat meat and poultry processors will be able to adopt the lethality based systems (LAE and EPL), which have minimal impact on the product quality such as color, texture and flavor of the RTE meat and poultry products. The processors will be able to achieve alternative 2, with incorporation of either the antimicrobial agents (buffered sodium citrate and sodium lactate with sodium diacetate) or with the application of the lethality based systems (LAE and EPL) into their processing systems.

Until now, the small and medium sized processors had few choices to incorporate the lethality based systems into their processing systems as majority of the applications were based on physical interventions such as hot water or steam, to heat product surface to temperatures that would be lethal to *L. monocytogenes*. These treatments also cause undesirable quality changes such as purge, color, flavor and texture. Further, the capital cost requirements for such systems are prohibitive for small processes.

##### **b. Long Term Impacts**

Incorporation of either the lethality systems (LAE and EPL) and/or the antimicrobial agents (Buffered sodium citrate and sodium lactate in combination with diacetate) will minimize the risk of *L. monocytogenes* from RTE meat and poultry products. In addition, adoption of these systems will minimize the risk of RTE product recalls by the processors, especially the small and medium sized processors.

#### **5. Publications resulting from this research**