

Effect of high voltage atmospheric cold plasma on inactivation of *Listeria monocytogenes* on Queso Fresco cheese

Introduction

Listeria monocytogenes (LM) is a pathogen in global dairy and ready-to-eat meat products. Listeriosis is most prevalent in at risk individuals including newborns, elderly, pregnant women, and immunocompromised individuals. Cheese products, particularly soft cheeses, are commonly implicated in listeriosis outbreaks. This is due to the ability of LM to grow at low temperatures consistent with refrigeration. Many mitigation methods are available and applied in industry to improve safety of the final product; however, few of these techniques achieve mitigation without notable degradation of important quality attributes, such as the deterioration in nutrition, and changes in flavor, color, and texture.

Objectives

This project aims to determine the efficacy of high voltage atmospheric cold plasma (HVACP) in the inactivation of *Listeria monocytogenes* strains in Queso Fresco cheese.

Methods

- Three LM isolates from commercial cheese products were cultured in brain heart infusion broth, standardized, and spot inoculated on the surface of 10g cheese samples for a final concentration of 10^4 CFU/g.
- 10 g cheese samples were pillow-packed in polypropylene reaction vessels and treated with double barrier discharge HVACP at 85kV for 3 minutes (Figure 1) and incubated overnight at 4 °C.
- Treated and control samples were homogenized 1:1 in PBS (10mL) and serially diluted for enumeration on Brilliance™ *Listeria* agar.

Methods (cont.)

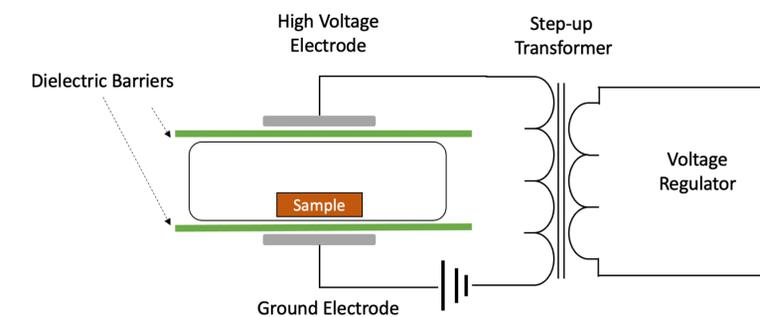


Figure 1. Schematic of high voltage atmospheric cold plasma with double barrier discharge.

Results

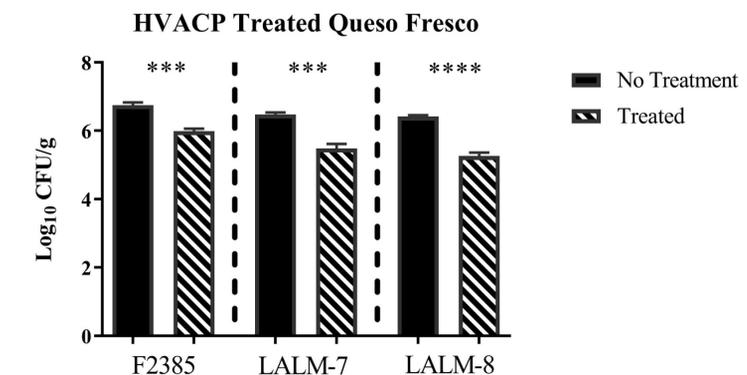


Figure 2. Log₁₀ CFU/g of 10g queso fresco cheese samples 24 hours after inoculation with three strains of *Listeria monocytogenes* at 10^4 CFU/g with and without HVACP treatment. *** $P < 0.0005$, **** $P < 0.00005$

Discussion

Plate counts revealed statistically significant reduction in all strains after treatment. Strains F2385, LALM-7, and LALM-8 were reduced by an average of 0.761, 0.996, and 1.15 log CFU/g, respectively. These results demonstrate the potential of HVACP in the inactivation of pathogenic LM strains isolated from commercial cheese environments. Further investigation is necessary to determine efficacy of treatment for larger sample sizes and clinical LM isolates.