

Public Abstract

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Title:EFFECT OF DIFFERENT MARINADE TREATMENTS ON SURVIVAL AND MORPHOLOGY OF PATHOGENS IN BEEF JERKY

In the early fall of 2003, the Food Safety and Inspection Service (FSIS 2004) found that producers of meat and poultry jerky were not adequately processing the meat to achieve the lethality required to kill or reduce the number of microorganisms. In this project, ground beef jerky was prepared with four different treatments i.e. traditional marinade (TM), modified marinade (MM), acetic acid-traditional marinade (AATM), Tween 20-traditional marinade (TWTM), along with a control.

Four different bacterial strains i.e. *E. coli* O157:H7, *S. Typhimurium*, *L. monocytogenes* and *S. aureus* were introduced individually on ground and formed beef jerky strips with the help of a basting brush and 30 minutes were allowed for bacterial attachment. The strips were then individually vacuum packaged and stored at room temperature for analysis at 7 day intervals up to 28 days starting from day 1. The parameters studied were pH, water activity and enumeration of microbial count.

Both pH and water activity values were lower than control for all the treatments used except TM. For microbial count, a decline of approximately 1.85 log to 4.17 log units was observed in different bacterial strains depending on the composition of the marinade treatment used. Scanning electron microscopy was performed to confirm the results of microbiological evaluation by visual observation of pathogens on the surface of beef jerky strips. In general, the cells from all the four bacterial populations treated with the marinade treatments appeared wrinkled and, unlike the control, some fibrils connecting the cells to each other or attaching to the membrane filter began to appear. The response of all four bacterial strains to marinade-induced stress as observed from Transmission Electron Microscopy (TEM) micrographs was in agreement with the results of microbiological evaluation, and enhanced the understanding of behavior of bacterial cells under marinade-stress conditions and assisted in analyzing the data obtained via quantitative techniques.

Traditional meat items like jerky are not well-studied because they have enjoyed such a long history of success without causing foodborne illness. Since that paradigm has changed, there is a need to identify new treatments and practices that can restore scientific reasoning to the preservation of beef rather than the quaint art that was formerly practiced. The main significance of this project was to provide jerky processors with necessary facts so that they may achieve compliance with recent regulatory guidelines and requirements to verify safety of commercial processes is possible.

There are over 120 small to medium-sized meat processing companies in Missouri and they represent a key audience for the information that was determined by this project. Since, these small meat processors are unable to implement challenge studies with pathogenic microorganisms in a commercial environment, this project provides them a unique opportunity to verify the effectiveness of practical processing modifications and ingredients. The model implemented in this project can provide alternative processes to commercial jerky manufacturers, and thus, impact future methods for production of safe jerky products.