SIMULATION OF CONTAMINATION THROUGH THE POST-HARVEST ENVIRONMENT USING SURROGATE ORGANISMS

A Thesis

by

MARIANA VILLARREAL SILVA

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

August 2010

Major Subject: Food Science and Technology

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Approved by:

Co-Chairs of Committee,	Margaret D. Hardin
	Alejandro Castillo
Committee Member,	Rhonda K. Miller
Intercollegiate Faculty Chair,	Alejandro Castillo

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ABSTRACT

Simulation of Contamination Through the Post-Harvest

Environment Using Surrogate Organisms. (August 2010)

Mariana Villarreal Silva, B.S., National Autonomous University of Mexico

Co-Chairs of Advisory Committee: Dr. Margaret D. Hardin
Dr. Alejandro Castillo

The beef industry has made tremendous strides in reducing pathogen contamination on carcasses. Multiple antimicrobial interventions have been validated for their use during harvesting. Information in regards to cross-contamination with pathogens in the post-harvest environment is limited. Surrogate microorganisms for enteric pathogens are commonly used to validate antimicrobial interventions and might allow for the simulation of cross-contamination through the post-harvest environment.

The purpose of this study was to determine how the post-harvest environment impacts the direct and indirect transmission of pathogens. This was achieved by using fluorescent protein-marked surrogate strains of *Escherichia coli* O157:H7 and *Salmonella* spp. from inoculated carcasses to the adjacent ones and to the equipment and facility in three different abattoirs.

Thirteen hide-on carcasses were inoculated using a gelatin-based slurry containing three nonpathogenic fluorescent protein-marked strains of *E. coli* biotype I. In order to determine direct and indirect cross-contamination, inoculated and adjacent carcasses were sampled (300 cm^2) during the harvesting process at different stages: after

hide opening (AHO), prior to evisceration (PE), after evisceration (AE), after splitting (AS), and after final intervention (AFI). Environmental samples consisting of the floor, walls, and air were tested as well as personal equipment including gloves, boots, and aprons. Equipment including hand knives, air knives, meat hooks, hide puller and split saw were also sampled.

Results showed evidence of cross-contamination between inoculated carcasses and the adjacent non-inoculated ones for all abattoirs. Although this occurred in all abattoirs, surrogate counts on carcasses were below detectable levels (<1.4 log CFU/cm^2) after antimicrobial interventions. Surrogates were found in low levels for all environmental samples. However surrogate counts from equipment such as knives, split saws, meat hooks, and hide puller were more frequently detected (15%) than those found on the floor, air and walls samples (10%). In the case of aprons, boots, and gloves, the prevalence of countable surrogate samples was 7%.

DEDICATION

To my family for their invaluable love

and moral support despite the distance

To Fabian, for his encouragement during

the progression of this thesis

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