

**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 cm²) 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 ($<1.4 \log \text{CFU/cm}^2$) 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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TABLE OF CONTENTS

	Page
ABSTRACT	iii
DEDICATION	v
ACKNOWLEDGMENTS.....	vi
TABLE OF CONTENTS	vii
LIST OF FIGURES.....	ix
LIST OF TABLES	x
INTRODUCTION.....	1
REVIEW OF LITERATURE.....	3
Characteristics of <i>Salmonella</i> spp	3
Classification.....	4
Virulence factors	4
Salmonellosis	6
Epidemiology	7
Characteristics of <i>E. coli</i>	9
Serology of <i>E. coli</i>	10
Pathogenic <i>E. coli</i>	10
Characteristics of <i>E. coli</i> O157:H7	12
Virulence factors	13
Epidemiology	14
The pre-harvest environment	15
The post-harvest environment.....	19
Sources of contamination in the post-harvest environment	19
Best practices in the post-harvest environment.....	21
Surrogate microorganisms.....	22
The ideal surrogate	22
The practical use of surrogates.....	23
MATERIALS AND METHODS	25
Bacterial cultures.....	25

	Page
Preparation of the gelatin matrix	25
Abattoirs and experimental design	26
Microbiological testing	30
Statistical analysis	30
RESULTS AND DISCUSSION	31
Carcass samples.....	32
Environmental samples	38
CONCLUSIONS	46
REFERENCES	47
VITA	57

LIST OF FIGURES

FIGURE		Page
1	Typical colonies of fluorescent protein-marked <i>E. coli</i> biotype I green (GFP-3), red (RFP-1), and yellow (YFP-66) strains grown on tryptic soy agar supplemented with ampicillin (100 µg/liter) and observed under UV light (365nm), showing low or null fluorescence in YFP-66 colonies (a) and the evident fluorescence in RFP-1 and GFP-3 colonies (b and c)	27
2	Typical colonies of ampicillin-resistant coliforms grown on violet red bile agar supplemented with ampicillin (100 µg/liter)	37
3	Proportion of environmental samples with detectable counts (> 1.4 log CFU/surface sampled) of fluorescent protein-marked <i>E. coli</i> biotype I RFP-1 and GFP-3 strains grown in tryptic soy agar supplemented with ampicillin (100 µg/liter) in three different abattoirs.	44

