Food Microbiology 62 (2017) 51–57

Contents lists available at ScienceDirect

Food Microbiology

journal homepage: www.elsevier.com/locate/fm

Effect of inoculum size, bacterial species, type of surfaces and contact time to the transfer of foodborne pathogens from inoculated to non-inoculated beef fillets *via* food processing surfaces

E. Gkana [a], N. Chorianopoulos [b], A. Grounta [a], K. Koutsoumanis [c], G.-J.E. Nychas [a, *]

[a] Laboratory of Microbiology and Biotechnology of Foods, Department of Food Science and Human Nutrition, Faculty of Foods, Biotechnology and Development, Agricultural University of Athens (AUA), Iera Odos 75, Athens 11855, Greece
[b] Institute of Technology of Agricultural Products, Hellenic Agricultural Organisation-DEMETER, Sofokli Venizelou 1, Lykovrysi 14123, Attica, Greece
[c] Laboratory of Food Microbiology and Hygiene, Department of Food Science and Technology, Faculty of Agriculture, Aristotle University of Thessaloniki, PO Box 256, Thessaloniki 541 24, Greece

ARTICLE INFO

Article history:
Received 9 May 2016
Received in revised form
25 August 2016
Accepted 23 September 2016
Available online 24 September 2016

Keywords:
Beef fillets
Cross-contamination
Surfaces
Listeria monocytogenes
Salmonella ser. Typhimurium
Escherichia coli O157:H7
Food safety
Risk analysis

ABSTRACT

The objective of the present study was to determine the factors affecting the transfer of foodborne pathogens from inoculated beef fillets to non-inoculated ones, through food processing surfaces. Three different levels of inoculation of beef fillets surface were prepared: a high one of approximately 10^7 CFU/cm^2, a medium one of 10^5 CFU/cm^2 and a low one of 10^3 CFU/cm^2, using mixed-strains of *Listeria monocytogenes*, or *Salmonella* enterica Typhimurium, or *Escherichia coli* O157:H7. The inoculated fillets were then placed on 3 different types of surfaces (stainless steel-SS, polyethylene-PE and wood-WD), for 1 or 15 min. Subsequently, these fillets were removed from the cutting boards and six sequential non-inoculated fillets were placed on the same surfaces for the same period of time. All non-inoculated fillets were contaminated with a progressive reduction trend of each pathogen's population level from the inoculated fillets to the sixth non-inoculated ones that got in contact with the surfaces, and regardless the initial inoculum, a reduction of approximately 2 log CFU/g between inoculated and 1st non-inoculated fillet was observed. *S.* Typhimurium was transferred at lower mean population (2.39 log CFU/g) to contaminated fillets than *E. coli* O157:H7 (2.93 log CFU/g), followed by *L. monocytogenes* (3.12 log CFU/g; $P < 0.05$). Wooden surfaces (2.77 log CFU/g) enhanced the transfer of bacteria to subsequent fillets compared to other materials (2.66 log CFU/g for SS and PE; $P < 0.05$). Cross-contamination between meat and surfaces is a multifactorial process strongly depended on the species, initial contamination level, kind of surface, contact time and the number of subsequent fillet, according to analysis of variance. Thus, quantifying the cross-contamination risk associated with various steps of meat processing and food establishments or households can provide a scientific basis for risk management of such products.