



# Simulation of decontamination and transmission of *Escherichia coli* O157:H7, *Salmonella* Enteritidis, and *Listeria monocytogenes* during handling of raw vegetables in domestic kitchens

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## ABSTRACT

Epidemiological data indicates that a large number of foodborne illnesses are attributed to cross-contamination during food preparation in the domestic kitchen. The objectives of this study were to evaluate the efficiency of household washing practices in removing *Escherichia coli* O157:H7, *Listeria monocytogenes*, and *Salmonella* Enteritidis on artificially contaminated lettuce and to determine the transfer rate of these three foodborne pathogens from contaminated lettuce to wash water, tomato, cabbage, and cutting boards during washing and cutting processes. Washing under the running tap water with scrubbing for 60 s was the most effective method in reducing pathogen populations by 1.86–2.60 log<sub>10</sub> CFU/g. Also, final rinsing and scrubbing practices were found to enhance the efficiency of washing treatment. In this study, the transfer rates of *S. Enteritidis*, *E. coli* O157:H7, and *L. monocytogenes* from cutting board to cabbage and tomato via cutting process (17.5–31.7%) were higher ( $P < 0.05$ ) than from wash water to cabbage and tomato (0.8–23.0%) during washing treatment. Overall, our findings suggest that wash water and cutting board can be potential vehicles in the dissemination of foodborne pathogens. Therefore, there is a need to promote consumer awareness for proper handling practices in the kitchen to minimise the risk of foodborne infection.

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## 1. Introduction

Fresh produce, particularly ready-to-eat or minimally processed, have been implicated in many foodborne illness outbreaks in recent years. *Salmonella* spp., *Escherichia coli* O157:H7, *Listeria monocytogenes* are of major concern due to the high frequency of reported cases and the severity of illness (Chang & Fang, 2007; EFSA, 2015). Vegetables such as mix salad are always consumed

raw or uncooked; therefore, no “kill step” is being applied to eliminate the foodborne pathogens. Consequently, it may enhance the likelihood of foodborne infections.

The best mean to reduce the risk of foodborne infections associated with ready-to-eat or minimally processed vegetables is to implement an efficient washing step. During food preparation, the washing process is believed to be a control point in ensuring the safety of the food as it aids in removing undesired residues and reducing the microbial load on fresh produces (Beuchat, 2002; Mattick et al., 2003). However, the efficacy of washing treatment is affected by several factors such as the force of washing and attachment of microorganisms or biofilm formation on the food

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