

Microbiological Contamination of Older Adults' Domestic Kitchens Associated with Self-Reported Food Safety Practices

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Introduction

Older adults (≥ 60 years) are more susceptible to acquiring foodborne illness due to weakened immune function (1); furthermore, the likelihood of mortality from foodborne pathogens is reported to be greater among older adults than the general population (2).

With data indicating that $\geq 95\%$ of all foodborne illnesses to be sporadic (3), the domestic kitchen is believed to be the source of significant foodborne disease resulting from consumers' unsafe food handling practices (4 & 5).

Consequently food hygiene practices in the home are essential to reduce foodborne illness among older adults, particularly as incidence data suggests that foodborne illness among older adults has increased over the last decade (6).

Although consumer food safety data suggests that older adults report the implement food safety malpractices more frequently than other consumers (7). However, currently there is a lack of data relating to the hygiene practices and microbial contamination of older adults domestic kitchens.

Aim

The study aimed to determine older adult consumers' self-reported hygiene practices, establish the domestic kitchen microbiological contamination and identify any significant relationships between self-reported practices and microbiological contamination that may increase risks associated with foodborne illness in the home kitchens of older adult consumers.

Methods

Participants were recruited according to predetermined criteria. Older adults' (≥ 60 years) domestic kitchens ($n = 100$) were visited, where:

- Older adults' self-reported hygiene practices were recorded using standardised interview techniques in accordance to microbial samples.
- Pre-determined food contact surfaces and equipment ($n = 1292$) were microbiologically analysed to determine aerobic colony count (ACC), *Enterobacteriaceae*, *Staphylococcus aureus* and *Listeria* spp. contamination following HPA National Standard Methods (8–11).

Data was entered into a specifically designed Microsoft Excel 2010 database and statistical analysis was conducted using IBM SPSS Statistics to determine significant differences or relationships between microbial contamination and self-reported practices.

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Results

Older adults self-reported hygiene practices

Although many older adults reported that food safety practices would be implemented, hygiene malpractices were frequently reported to be implemented by older adults in this study.

Cleaning equipment:

- Reported usage length of dishcloths and sponges was on average 15 days, reported usage ranged from one day to six months.
- Reported usage length of dish-brushes ranged from two weeks up to two years.

Refrigerator:

- Refrigerator cleaning frequency was reported to vary from daily to never (on average monthly).
- Reported cleaning method included 'wipe with a cloth only' (24%), 'use detergent and hot water' (33%), 'antibacterial spray'/'diluted bleach' (20%) or 'other' including use of vinegar or bicarbonate of soda (15%).

Chopping board:

- Majority of older adults (92%) had chopping boards in the kitchen which included: plastic (51%) wooden (27%) marble and glass (14%).
- Reported cleaning methods included 'wipe with cloth only' (6%), 'use detergent and hot water in the sink' (63%), 'in the dishwasher' (23%).

Older adults domestic kitchen microbial contamination

Mean contamination determined in older adults domestic kitchens is indicated in Figure 1. *Listeria* spp. was isolated in 7% of older adult kitchens; 2% of which were *L. monocytogenes*, both isolated on hand contact surfaces (refrigerator door handle and hot water tap handle).

Cleaning equipment:

- The highest level of microbial contamination was determined on 'in-use' cleaning equipment with dish-brushes, dishcloths and sponges contaminated with $<9.3 \log_{10}$ CFU ACC, $<8.8 \log_{10}$ CFU *Enterobacteriaceae* and $<7.0 \log_{10}$ CFU *S. aureus*.

Refrigerator:

- L. monocytogenes* isolated on one refrigerator door handle.
- Up to 61% of refrigerators were determined to be contaminated with ACC

Chopping boards:

- Mean contamination $3.7 \log_{10}$ CFU ACC and $3.3 \log_{10}$ CFU *Enterobacteriaceae* was determined.
- S. aureus* and *L. monocytogenes* was not isolated

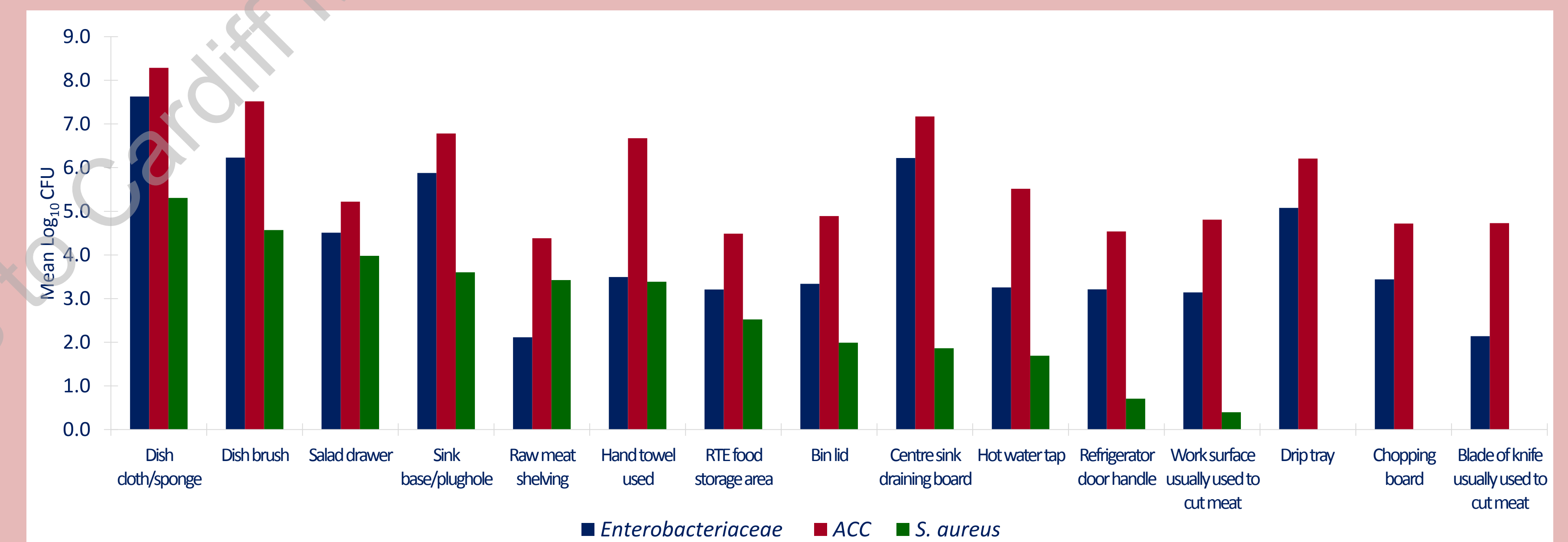


Figure 1. Mean microbiological contamination of equipment and surfaces in older adult consumers' domestic kitchens ($n = 100$)

Impact of older adults' hygiene practices on microbiological contamination of domestic kitchens

Cleaning equipment:

- Increased length of time dish-brushes were reportedly in use for was significantly correlated ($r = 0.349$, $p < 0.05$) with increased *Enterobacteriaceae* contamination.
- Counts of ACC's on dishcloth/sponges were significantly correlated ($r = 0.658$, $p < 0.05$) with counts of ACC's on chopping boards

Refrigerator:

- A significant correlation ($r = 0.26$, $p < 0.05$) was determined between ACC contamination of refrigerator food storage areas and the reported length of time since the refrigerator was last cleaned. No significant differences ($p > 0.05$) in contamination and reported method of cleaning.

Chopping board:

- Although no significant differences ($p > 0.05$) in contamination and material of chopping board were determined, significant differences were determined between reported cleaning method and microbial contamination of chopping boards ($p < 0.05$), with greater ACC contamination on boards reportedly only 'wiped with cloth', as opposed to 'washed with detergent in-sink'/'in a dishwasher'.

Significance of the study

- The novel approach from this study, combining microbiological data with observed and self-reported consumer food safety data facilitates a comparison between domestic hygiene practices (reported method and frequency) with actual microbial contamination.
- Findings suggests older adults fail to implement adequate and regular food hygiene practices in the domestic kitchen; thus potentially increasing the risks associated with pathogenic cross-contamination in the domestic kitchen and the potential for foodborne.
- Data from this study has determined a need for older adults to improve food hygiene practices in the domestic kitchen; consequently such data may be used to inform the development of targeted food safety education to improve the hygiene practices of older adults.