

Microbial contamination of domestic kitchens: potential for foodborne illness among older adults.

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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 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.

Research aim

The aim of this study was to determine microbiological contamination older adults' domestic kitchens that may increase the risk of foodborne illness.

Methods

A systematic review of literature was conducted to identify domestic kitchen sites commonly contaminated with foodborne pathogens to inform domestic kitchen microbial sampling schedule. A pilot study was undertaken to assess feasibility and reliability of the data collection methods.

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

Pre-determined food contact surfaces and equipment ($n = 1292$) in older adults domestic kitchens ($n = 100$) were microbiologically analysed to determine aerobic colony count (ACC), *Enterobacteriaceae*, *Staphylococcus aureus* and *Listeria* spp. contamination following HPA National Standard Methods (8–11)

Older adults' self-reported hygiene practices were recorded using standardized interview techniques in accordance to microbial samples.

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.

Results and Discussion

Older adults domestic kitchen microbial contamination

Microbial contamination determined in older adults domestic kitchens is indicated in Figure 1.

The highest level of microbial contamination was determined on 'in-use' cleaning equipment with dish-brushes, dishcloths and sponges contaminated with:

- $< 9.28 \log_{10}$ CFU ACC
- $< 8.81 \log_{10}$ CFU *Enterobacteriaceae*
- $< 7.03 \log_{10}$ CFU *S. aureus*

Listeria spp. was isolated in 7% of older adult kitchens; 2% of which were *L. monocytogenes*, both isolated on hand contact surfaces (one refrigerator door handle and a hot water tap handle).

- Mean ACC contamination was determined to be significantly greater ($p < 0.001$) at wet sites than dry sites in domestic kitchens.
- Increased length of time dish-brushes were reportedly in use for was significantly correlated ($r = 0.349$, $p < 0.05$) with increased *Enterobacteriaceae* contamination.
- 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/dishwasher'.
- Counts of ACC's on dishcloth/sponges were significantly correlated ($r = 0.658$, $p < 0.05$) with counts of ACC's on chopping boards.
- 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.

Conclusion

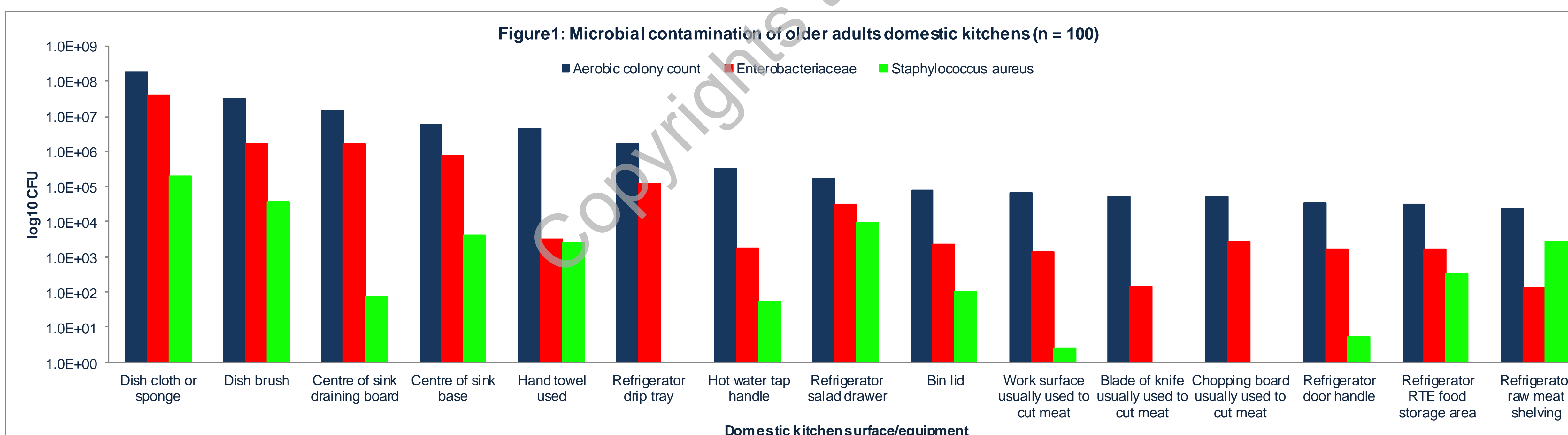
The novel approach from this study, combining microbiological data with observed and self-reported consumer food safety data facilitates a comparison between domestic hygiene practices (reported method and frequency) with actual microbial contamination.

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.

Furthermore 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.

Acknowledgments

The principal investigator wishes to acknowledge the receipt of the SfAM Studentship grant awarded to attend the conference.



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