Addressing the Lack of Cognitive and Behavioural Research Detailing Older Adult Consumer’s Food Safety Risks Associated with Listeriosis. 

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Introduction

Listeria monocytogenes, responsible for human listeriosis, is associated with highest typhoid fever hospitalisations and mortality rates. Since 2000, incidence of listeriosis has predominantly been associated with adults ≥60 years which has increased significantly. Due to the psychosomatic presentation of L. monocytogenes, international consumer food safety recommendations to reduce the risk of Listeria give importance to storage time and temperature control of RTE foods (5°C) and are identified as:

- Not heating RTE foods.
- Avoiding prolonged storage of open RTE food products, by consuming within two days of opening.
- Ensuring the safe operating temperatures (5°C) of domestic food storage.

The UK Food Standards Agency (FSA) (2015), the Advisory Committee on the Microbiological Safety of Foods (ACMSF) (2015) and the U.S. Food and Drug Administration (2015) all recommended research was required to determine domestic food handling and storage practices of consumers ≥60 years to better understand the risk factors that may be associated with listeriosis. 

To address the identified need, the project aimed to:

- Determine older adult consumers’ (≥60 years) cognitive and behavioural risk factors of domestic food handling and storage practices associated with listeriosis risk factors.
- Evaluate the potential impact of older adults’ domestic food handling and storage practices on L. monocytogenes.
- Combining findings from cognitive, behavioural and microbiological studies alongside our understanding of consumer food safety data such as lists of older adults.

Methods

To address the aim of the research, the project was conducted in a number of research studies consisting of three phases:

- Phase one: a desk-based review of consumer food safety studies (2016) to identify gaps in detail regarding older adults’ food handling practices.

- Phase two: a mixed-methods approach involving older adults (≥60 years) which included:
  - Computer assisted interviews regarding perceptions and attitudes towards domestic food safety.
  - Observation of food safety behaviour in a domestic kitchen.
  - Laboratory survey of domestic kitchen storage practices.
  - Domestic kitchen microbiological survey to isolate L. monocytogenes.
  - Domestic refrigeration temperatures of 12 older adults.

- Phase three: observed and self-reported storage malpractices identified in phase two, informed the development of a laboratory based re-enactment to determine the potential impact of older adults’ food storage practices on L. monocytogenes survival and growth.

Ethical Approval: Approval was obtained from the Health Care and Food Ethics Panel at Cardiff Metropolitan University.

Funding: This study was supported by the Society for Applied Microbiology (SACRAM) and the Central Wales Microbiologists (CWM) under the Microbiologist of the Year (MOY) Scheme.

Phase one: Review of consumer food safety cognitive and behavioural studies (n=165)

Culling, 165 published consumer food safety studies, undertaken between 1992 and 2013, from 20 different countries, were included for review. The majority of studies were undertaken in the USA (n=58) and the UK (n=36) with 20% studies conducted across the Netherlands (n=32), India (n=15) and Austria (n=4) illustrating that consumer food safety of is an international issue.

Inclusion of listeriosis related practices:

The review determined only 41% of studies included consumer data relating to listeriosis. This is not surprising when comparing to other food safety practices associated with food safety recommendations to reduce the risk of Listeria. The review determined only 41% of studies included consumer data relating to listeriosis. 

PHASE TWO OUTCOMES

- The in-depth cognitive, behavioural and microbiological analysis of Listeria risk factors associated with older adults determined:
  - 10% of adults acted on information regarding refrigeration temperatures (≤5°C) was widespread among older adults.
  - L. monocytogenes was seldom isolated in older adult domestic food storage.
- Actual behaviour and attitudinal data relating to listeriosis risk factors are predominantly lacking.

PHASE THREE OUTCOMES

The re-enactment of observed and reported food storage malpractices of older adults determined:

- Domestic storage conditions exceeding recommended consumer food safety guidelines for L. monocytogenes was identified.
- Reduced growth rates and generation times were determined.

Phase two: Cognitive, behavioural and microbiological study of older adults (n=100)

One hundred older adults (≥60 years) participated in the mixed-methods research study. A completion rate of older adult consumer’s participation was 84% and an overall 87% of observed behaviour and attitudinal behavior of food safety practices was presented in Table 3.

PHASE THREE OUTCOMES

The re-enactment of observed and reported food storage malpractices of older adults determined:

- Domestic storage conditions exceeding recommended consumer food safety guidelines for L. monocytogenes was identified.
- Reduced growth rates and generation times were determined.

Phase three: Laboratory re-enactment of observed storage malpractices (n=150)

Oberved and self-reported data from phase two were utilised to inform the laboratory based re-enactment of storage practices to determine the growth of L. monocytogenes. 

Re-enacted storage conditions

Re-enactment assumed using soft cheese and RTE meat inoculated with ≤5 (CFU) L. monocytogenes, stored at recommended refrigeration temperatures (2.0°C; ≤5°C); refrigeration temperatures exceeding recommended (19°C; ≥5°C) and ambient temperature (19°C; ≥5°C). Samples were analysed every 24h for >2127.

Growth of listeria monocytogenes

Reduce L. monocytogenes growth at all storage temperatures (Table 4): Genereation times indicated slower growth of at 2.0°C (49.1h) than 5.0°C (12.9h) (p<0.05).

Table 4. Growth rate of L. monocytogenes at 2.0°C and 5.0°C.

<table>
<thead>
<tr>
<th>Temperature</th>
<th>Generation Time (h)</th>
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<tr>
<td>2.0°C</td>
<td>49.1</td>
</tr>
<tr>
<td>5.0°C</td>
<td>12.9</td>
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Storage of RTE ham and soft cheese at temperatures exceeding recommendations had a statistically significant impact on mean population (Figures 1), the growth rate, generation rate and maximum population of L. monocytogenes when compared to storage at recommended storage temperatures.

REFERENCES

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