

Citation:

Parry SM, Slader J, Humphrey T, Holmes B, Guildea Z, Palmer SR; SEWIDLG (South East Wales Infectious Disease Liaison Group). A case-control study of domestic kitchen microbiology and sporadic *Salmonella* infection. *Epidemiol Infect.* 2005 Oct; 133 (5): 829-835.

PubMed ID: [16181502](#)

Study Design:

Case-control study

Class:

C - [Click here](#) for explanation of classification scheme.

Research Design and Implementation Rating:

 NEUTRAL: See Research Design and Implementation Criteria Checklist below.

Research Purpose:

To investigate risk factors associated with sporadic *Salmonella* infections in domestic kitchens.

Inclusion Criteria:**Case Selection**

- An individual with a microbiologically confirmed *Salmonella* infection
- The individual could not be recognized as a part of a general outbreak
- More than one year in age
- No international travel for seven days prior to the onset of illness
- Resident in the Southeast Wales area between July 1997 and December 1998.

Control Selection

- Control households were selected by applying random numbers to the electoral register
- Control households were selected from the same electoral ward as the case.

Exclusion Criteria:

- The individual confirmed to have *Salmonella* infection was a part of a general outbreak
- The individual confirmed to have *Salmonella* infection was less than one year of age
- The individual confirmed to have *Salmonella* infection had traveled internationally during the seven days prior to the onset of illness.

Description of Study Protocol:**Recruitment**

- Cases were recruited when a confirmed case of *Salmonella* infection was reported to the local health authority
- Control cases were recruited based on random sampling from the electoral register. Control households were from the same electoral ward as the case
- Signed informed consent was obtained for participation in the survey and data collection from each case and control household.

Design

- Case-control design
- Households that consented to participate in the study completed a standard questionnaire including information on kitchen cleaning, food handling and dishcloth hygiene. The kitchen dishcloth in use at the time of the home visit was taken to the laboratory; in addition, a swab was taken of the lower internal surface of each refrigerator for analysis of the presence of *Salmonella*, total enterobacterial count and total aerobic colony count.

Blinding Used

All samples taken from both case and control households were analyzed in the laboratory blind to case/control status.

Statistical Analysis

- Odds ratios (OR) were calculated with exact 95% confidence intervals (CI) and Mantel-Haenszel Chi Square test were used for significance
- Odds ratios were adjusted for confounders by including appropriate terms in a logistic regression model
- Mann-Whitney tests were used for non-parametric data when appropriate.

Data Collection Summary:

Timing of Measurements

- Once informed consent was obtained, a questionnaire was administered and the kitchen dishcloth and lower internal surface of the refrigerator were microbiologically analyzed during a home visit from the local health authority
- For case households, the mean delay between onset of illness and home visit was 19.4 days (range four to 58 days)
- The period between case and control home visits averaged 35 days.

Dependent Variables

- *Salmonella* isolated on the dishcloth in use in the kitchen at the time of the home visit
- *Salmonella* isolated on the lower internal surface of the refrigerator following a swab at the time of the home visit
- Enterobacterial count from the dishcloth in use in the kitchen at the time of home visit
- Enterobacterial count from the refrigerator swab at the time of home visit.

Independent Variables

Presence of microbiologically confirmed *Salmonella* infection in a household member.

Control Variables

- Mean age of the primary food handler
- Time of year that the interview was conducted.

Description of Actual Data Sample:

- *Initial N*: All 137 cases and 99 of the 129 controls approached agreed to participate in the study
- *Attrition (final N)*: 125 cases and 81 controls completed a home visit and had dishcloths and refrigerator swabs taken for microbiological analysis
- *Age*: Raw data on age and household size was not reported
- *Anthropometrics*
 - Case households were more likely to have been interviewed during the third quarter of the year (July to September)
 - Control households were similar to all households in the area in distribution by age of occupants and household size
 - Case households were significantly more likely to have younger main food handlers ($P < 0.0001$) than control households
- *Location*: Southeast Wales area (population 1.3 million), United Kingdom.

Summary of Results:

Key Findings

- *Salmonella* was isolated from both case and control dishcloths and refrigerators, but there were no significant differences between the two groups
- Colony counts were similar between both case and control dishcloths and refrigerator swabs
- There was no relationship between the total colony counts and presence of *Salmonella*
- There was no evidence that cases of *Salmonella* infection were more likely to have kitchens that were contaminated with these bacteria or have higher bacterial counts than controls.

Author Conclusion:

- The authors conclude that there is no convincing evidence that kitchens that are contaminated with *Salmonella* are more likely to give rise to a case of *Salmonella* infection than those that are not contaminated
- While there is some evidence that bacteria counts recorded during the summer months were higher than in winter months, the distributions of enterobacterial counts and aerobic colony counts were similar in case and control kitchens
- The case group was broadly representative of all reported *Salmonella* infections meeting the case definition, although it is accepted that reported cases are only a small proportion of all cases in the community
- The assumption that the vehicle for infection is food consumed and prepared in the home may be incorrect. It was noted that 65% of the cases had eaten meals outside the home in the 72 hours prior to the onset of symptoms.

Reviewer Comments:

- *The authors calculated that 153 cases and controls would be required to detect an OR of two*

with a 95% CI. 137 cases were recruited and 99 controls agreed to participate in the study. Fewer cases and controls provided dishcloth samples and refrigerator swabs (125 cases and 81 controls). This may have contributed to the lack of significant findings of the study

- While case households were significantly more likely to have younger main food handlers ($P < 0.0001$) than control households, the authors adjusted for potential confounding factors at baseline in mean age of the primary food handler and time of year that the interview was conducted by logistic regression
- Findings are difficult to interpret as 65% of individuals who developed salmonellosis had eaten meals prepared outside the home kitchen 72 hours before the onset of symptoms.

Research Design and Implementation Criteria Checklist: Primary Research

Relevance Questions

- | | | |
|----|---|------------------------------|
| 1. | Would implementing the studied intervention or procedure (if found successful) result in improved outcomes for the patients/clients/population group? (Not Applicable for some epidemiological studies) | <input type="checkbox"/> Yes |
| 2. | Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about? | <input type="checkbox"/> Yes |
| 3. | Is the focus of the intervention or procedure (independent variable) or topic of study a common issue of concern to nutrition or dietetics practice? | <input type="checkbox"/> Yes |
| 4. | Is the intervention or procedure feasible? (NA for some epidemiological studies) | <input type="checkbox"/> Yes |

Validity Questions

- | | | |
|------|---|------------------------------|
| 1. | Was the research question clearly stated? | <input type="checkbox"/> Yes |
| 1.1. | Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified? | <input type="checkbox"/> Yes |
| 1.2. | Was (were) the outcome(s) [dependent variable(s)] clearly indicated? | <input type="checkbox"/> Yes |
| 1.3. | Were the target population and setting specified? | <input type="checkbox"/> Yes |
| 2. | Was the selection of study subjects/patients free from bias? | <input type="checkbox"/> Yes |
| 2.1. | Were inclusion/exclusion criteria specified (e.g., risk, point in disease progression, diagnostic or prognosis criteria), and with sufficient detail and without omitting criteria critical to the study? | <input type="checkbox"/> Yes |
| 2.2. | Were criteria applied equally to all study groups? | <input type="checkbox"/> Yes |
| 2.3. | Were health, demographics, and other characteristics of subjects described? | <input type="checkbox"/> Yes |
| 2.4. | Were the subjects/patients a representative sample of the relevant population? | <input type="checkbox"/> Yes |

3.	Were study groups comparable?	No
3.1.	Was the method of assigning subjects/patients to groups described and unbiased? (Method of randomization identified if RCT)	Yes
3.2.	Were distribution of disease status, prognostic factors, and other factors (e.g., demographics) similar across study groups at baseline?	No
3.3.	Were concurrent controls used? (Concurrent preferred over historical controls.)	Yes
3.4.	If cohort study or cross-sectional study, were groups comparable on important confounding factors and/or were preexisting differences accounted for by using appropriate adjustments in statistical analysis?	N/A
3.5.	If case control or cross-sectional study, were potential confounding factors comparable for cases and controls? (If case series or trial with subjects serving as own control, this criterion is not applicable. Criterion may not be applicable in some cross-sectional studies.)	No
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
4.	Was method of handling withdrawals described?	Yes
4.1.	Were follow-up methods described and the same for all groups?	Yes
4.2.	Was the number, characteristics of withdrawals (i.e., dropouts, lost to follow up, attrition rate) and/or response rate (cross-sectional studies) described for each group? (Follow up goal for a strong study is 80%.)	Yes
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	Yes
4.4.	Were reasons for withdrawals similar across groups?	???
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
5.	Was blinding used to prevent introduction of bias?	No
5.1.	In intervention study, were subjects, clinicians/practitioners, and investigators blinded to treatment group, as appropriate?	N/A
5.2.	Were data collectors blinded for outcomes assessment? (If outcome is measured using an objective test, such as a lab value, this criterion is assumed to be met.)	Yes
5.3.	In cohort study or cross-sectional study, were measurements of outcomes and risk factors blinded?	N/A
5.4.	In case control study, was case definition explicit and case ascertainment not influenced by exposure status?	No

5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
6.	Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were intervening factors described?	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	N/A
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	Yes
6.3.	Was the intensity and duration of the intervention or exposure factor sufficient to produce a meaningful effect?	Yes
6.4.	Was the amount of exposure and, if relevant, subject/patient compliance measured?	Yes
6.5.	Were co-interventions (e.g., ancillary treatments, other therapies) described?	N/A
6.6.	Were extra or unplanned treatments described?	N/A
6.7.	Was the information for 6.4, 6.5, and 6.6 assessed the same way for all groups?	Yes
6.8.	In diagnostic study, were details of test administration and replication sufficient?	N/A
7.	Were outcomes clearly defined and the measurements valid and reliable?	Yes
7.1.	Were primary and secondary endpoints described and relevant to the question?	Yes
7.2.	Were nutrition measures appropriate to question and outcomes of concern?	Yes
7.3.	Was the period of follow-up long enough for important outcome(s) to occur?	Yes
7.4.	Were the observations and measurements based on standard, valid, and reliable data collection instruments/tests/procedures?	Yes
7.5.	Was the measurement of effect at an appropriate level of precision?	Yes
7.6.	Were other factors accounted for (measured) that could affect outcomes?	Yes
7.7.	Were the measurements conducted consistently across groups?	Yes
8.	Was the statistical analysis appropriate for the study design and type of outcome indicators?	Yes
8.1.	Were statistical analyses adequately described and the results reported appropriately?	Yes
8.2.	Were correct statistical tests used and assumptions of test not violated?	Yes

8.3.	Were statistics reported with levels of significance and/or confidence intervals?	Yes
8.4.	Was "intent to treat" analysis of outcomes done (and as appropriate, was there an analysis of outcomes for those maximally exposed or a dose-response analysis)?	N/A
8.5.	Were adequate adjustments made for effects of confounding factors that might have affected the outcomes (e.g., multivariate analyses)?	Yes
8.6.	Was clinical significance as well as statistical significance reported?	Yes
8.7.	If negative findings, was a power calculation reported to address type 2 error?	Yes
9.	Are conclusions supported by results with biases and limitations taken into consideration?	Yes
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
10.	Is bias due to study's funding or sponsorship unlikely?	Yes
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes

Copyright American Dietetic Association (ADA).