

**Citation:**

Sharma M, Eastridge J, Mudd C. Effective household disinfection methods of kitchen sponges. *Food Control*. 2009; 20: 310-313.

**Study Design:**

Laboratory simulation study

**Class:**

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

**Research Design and Implementation Rating:**

POSITIVE: See Research Design and Implementation Criteria Checklist below.

**Research Purpose:**

To determine the most effective and rapid method available to a household to disinfect a heavily contaminated kitchen sponge.

**Inclusion Criteria:**

Not applicable.

**Exclusion Criteria:**

Not applicable.

**Description of Study Protocol:****Design**

- Commercial sponges (without scrub pads, 60mm x 38mm x 15mm) were incubated in a ground beef slurry for 48 hours at room temperature (22°C)
- Incubated sponges were treated with one of the following disinfection methods:
  - Sterile deionized water (for one minute)
  - Single strength lemon juice (pH 2.9, for one minute)
  - 10% solution of household bleach (5.25% sodium hypochlorite, for three minutes)
  - Household microwave oven (2,450 MHz and 1.30 kW for one minute)
  - Household dishwasher (normal cycle with water temperature boost feature and heated drying cycle, no dish-washing detergent was added)
- Treated sponges and untreated (control) sponges were transferred to a 1 X Dey Engley (DE) broth (40ml) and stomached for two minutes
- Undiluted suspensions or serial dilutions (0.1ml, in duplicate) of DE broth in 0.1% peptone water were spiral-plated on Tryptic Soy agar (TSA) and on Dichloran Rose Bengal Chloramphenicol agar (DRBC)
- TSA plates were incubated at 37°C for 24 hours before enumeration of aerobic bacterium

- DRBC plates were incubated at 25°C for five days before enumeration of yeasts and molds
- Three replicates of each treatment were performed.

### Statistical Analysis

- Analysis of variance
- Least significant difference mean separation tests ( $P \leq 0.05$ ).

### Data Collection Summary:

#### Timing of Measurements

- Aerobic bacterium were enumerated after incubated at 37°C for 24 hours
- Yeasts and molds were enumerated after incubated at 25°C for five days.

#### Dependent Variables

- Counts of aerobic bacterium
- Counts of yeasts and molds.

#### Independent Variables

Different disinfection methods:

- 10% bleach
- Lemon juice
- Deionized water
- Microwave
- Dishwasher.

#### Control Variables

No disinfecting treatment.

### Description of Actual Data Sample:

- *Initial N*: Three replicates of each treatment (six) were performed
- *Attrition (final N)*: Three (replicate) x six (treatment) x two (type of infection) = 36
- *Location*: Food safety laboratory, Animal and Natural Resources Institute, Beltsville, Maryland, US.

### Summary of Results:

- Effects on lowering bacterium:
  - Untreated (control) sponges had total counts of 7.5 log colony forming units (CFU) of aerobic bacteria per sponge
  - Microwave treatment of contaminated sponges significantly ( $P < 0.05$ ) lowered bacterium compared to other treatment methods, with less than 0.4 log CFU per sponge surviving one minute of exposure
  - Dish-washing treatment was significantly more effective than chemical treatments, with 1.8 log CFU per sponge surviving bacterium after treatment

- Among chemical treatments, sponges soaked in 10% bleach had bacterium only 0.3 and 0.5 log CFU per sponge lower than those soaked in water or lemon juice, respectively
- Effects on lowering yeasts and molds:
  - Untreated (control) sponges had total counts of 7.3 log CFU of yeasts and mold per sponge
  - Microwaving or dish washing treatment was significantly effective (0.9 and 0.4 log CFU per sponge surviving yeasts and molds, respectively) than chemical treatments
  - No statistically significant difference between microwaving and dish-washing treatments
  - Soaking sponges in 10% bleach for three minutes or in lemon juice for one minute significantly lowered counts of yeasts and molds (6.1 and 6.1 log CFU per sponge), compared to counts on sponges soaked in water 6.9 log CFU per sponge).

### Author Conclusion:

- Microwaving or dish-washing treatments of kitchen sponges may provide fast and effective methods to kill foodborne pathogens in a household kitchen environment
- Chemical treatments to kill microorganisms in or on kitchen sponges proved less effective than microwaving or dish-washing
- Treating kitchen sponges through these disinfection methods may reduce spoilage of foods and foodborne illness in the home.

### Reviewer Comments:

*The authors indicated that lower disinfection effect of 10% bleach and lemon juice may have been due to insufficient contact time.*

### 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) | Yes |
| 2. | Did the authors study an outcome (dependent variable) or topic that the patients/clients/population group would care about?   | 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?  | Yes |
| 4. | Is the intervention or procedure feasible? (NA for some epidemiological studies)  | Yes |

## Validity Questions

<b>1.</b>	<b>Was the research question clearly stated?</b>	Yes
1.1.	Was (were) the specific intervention(s) or procedure(s) [independent variable(s)] identified?	Yes
1.2.	Was (were) the outcome(s) [dependent variable(s)] clearly indicated?	Yes
1.3.	Were the target population and setting specified?	N/A
<b>2.</b>	<b>Was the selection of study subjects/patients free from bias?</b>	N/A
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?	N/A
2.2.	Were criteria applied equally to all study groups?	N/A
2.3.	Were health, demographics, and other characteristics of subjects described?	N/A
2.4.	Were the subjects/patients a representative sample of the relevant population?	N/A
<b>3.</b>	<b>Were study groups comparable?</b>	Yes
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?	Yes
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.)	N/A
3.6.	If diagnostic test, was there an independent blind comparison with an appropriate reference standard (e.g., "gold standard")?	N/A
<b>4.</b>	<b>Was method of handling withdrawals described?</b>	N/A
4.1.	Were follow-up methods described and the same for all groups?	N/A

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%.)	N/A
4.3.	Were all enrolled subjects/patients (in the original sample) accounted for?	N/A
4.4.	Were reasons for withdrawals similar across groups?	N/A
4.5.	If diagnostic test, was decision to perform reference test not dependent on results of test under study?	N/A
<b>5.</b>	<b>Was blinding used to prevent introduction of bias?</b>	N/A
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.)	N/A
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?	N/A
5.5.	In diagnostic study, were test results blinded to patient history and other test results?	N/A
<b>6.</b>	<b>Were intervention/therapeutic regimens/exposure factor or procedure and any comparison(s) described in detail? Were intervening factors described?</b>	Yes
6.1.	In RCT or other intervention trial, were protocols described for all regimens studied?	Yes
6.2.	In observational study, were interventions, study settings, and clinicians/provider described?	N/A
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?	N/A
6.8.	In diagnostic study, were details of test administration and replication sufficient?	Yes
<b>7.</b>	<b>Were outcomes clearly defined and the measurements valid and reliable?</b>	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?	N/A
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
<b>8.</b>	<b>Was the statistical analysis appropriate for the study design and type of outcome indicators?</b>	<b>Yes</b>
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?	N/A
<b>9.</b>	<b>Are conclusions supported by results with biases and limitations taken into consideration?</b>	<b>Yes</b>
9.1.	Is there a discussion of findings?	Yes
9.2.	Are biases and study limitations identified and discussed?	Yes
<b>10.</b>	<b>Is bias due to study's funding or sponsorship unlikely?</b>	<b>Yes</b>
10.1.	Were sources of funding and investigators' affiliations described?	Yes
10.2.	Was the study free from apparent conflict of interest?	Yes