Food Safety Consumer Research Project: Meal Preparation Experiment Related to Poultry Washing

Executive Summary
August 2019

The Food Safety and Inspection Service (FSIS) of the U.S. Department of Agriculture (USDA) contracted with RTI International and its subcontractor North Carolina State University (NCSU) to conduct meal preparation experiments to evaluate consumer food handling behaviors in a test kitchen. The research team is conducting five separate iterations of the study to address a specific consumer behavior and to determine the effectiveness of a behavior change intervention. The meal preparation experiments are part of a larger 5-year annual study that also includes focus groups (two iterations) and web surveys (two iterations). This report describes the results of the second iteration of the meal preparation experiment that examined consumers' washing of poultry when preparing a meal of chicken thighs.

RTI and NCSU conducted the study in eight test kitchen facilities located in the Raleigh-Durham area of North Carolina and Lillington, North Carolina, a rural location, with individuals who self-reported washing or rinsing raw poultry when cooking at home. Three existing Office of Public Affairs and Consumer Education (OPACE) food safety messages were delivered to treatment group participants via email before their appointment; each message was sent twice as part of the signature line of the NCSU scheduling team. One message focused on not washing poultry before cooking to avoid cross-contamination and included a link to an FSIS YouTube video (with screenshot of video), one message recommended using separate cutting boards for raw and ready-to-eat foods (with graphic), and one message featured an FSIS "Clean" infographic with information on not washing poultry and the messages to wash hands for 20 seconds with soap and warm water and to wash kitchen surfaces and equipment (e.g., utensils). Control group participants emails did not include the intervention messages.

In each test kitchen, six cameras recorded participants' actions at various locations throughout the kitchen and recorded the meal preparation from beginning to end. Participants in the control and treatment groups were observed while cooking chicken thighs (spiked with harmless traceable nonpathogenic *E. coli* strain DH-5 alpha) and preparing a mixed green salad recipe to determine whether they washed their poultry, the extent of cross-contamination throughout the kitchen, and whether they adhered to other food safety behaviors throughout meal preparation. Following meal preparation and participants' cleaning and/or sanitizing of the kitchen, the study team collected microbiological samples from surfaces and lettuce and analyzed the samples for prevalence and level of DH-5 alpha. Participants participated in a post-observation interview to collect information on their usual food preparation practices and possible predictors of behavior change. A total of 300 people participated in the study (158 control, 142 treatment).

Key Findings

The key findings from the study are summarized below:

Poultry Washing

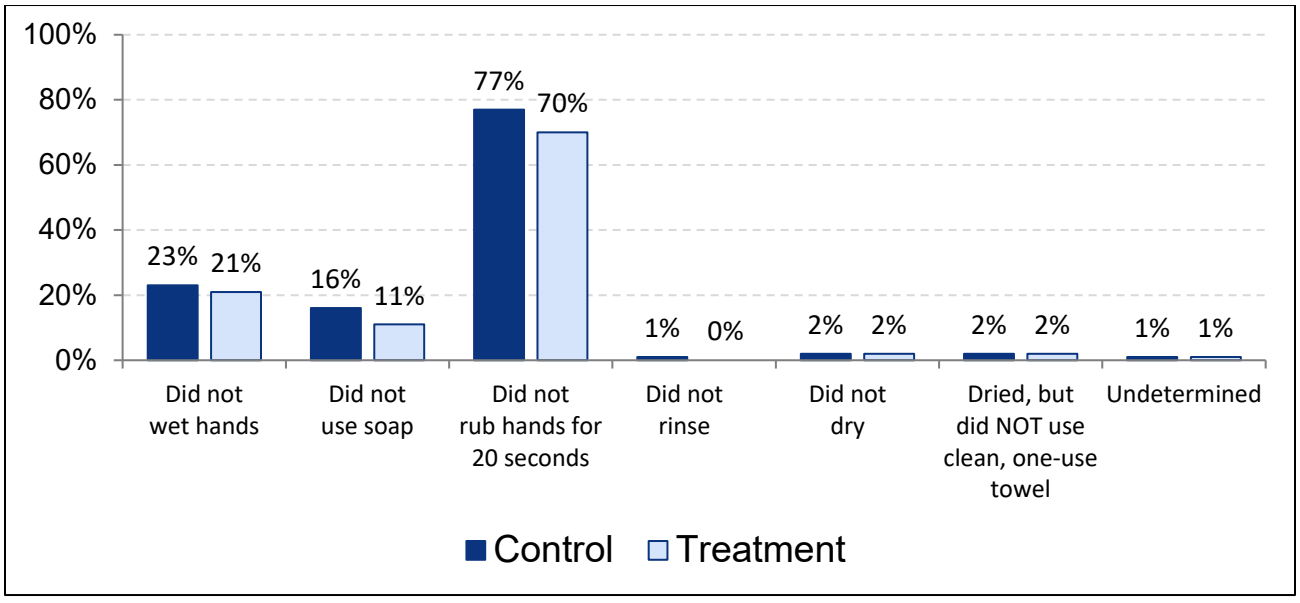
- The food safety messages in the emails effectively encouraged participants not to wash raw chicken thighs before cooking: 93 percent of treatment group participants did not wash the chicken compared with 39 percent for the control group.

- When washing the chicken, most participants rinsed it in the sink rather than submerging it in the sink or container. Participants who wash chicken when preparing it at home reported that they did so to remove blood/slime (30 percent) or because that is how a family member does it (19 percent).
- In the post-observation interviews, 66 percent of participants stated that reading the email messages influenced their cooking behavior in the kitchen; of these participants, 40 percent reported that their actions were influenced by learning new information about preparing poultry.

Handwashing

- Proper handwashing was addressed in one of the email messages but did not influence participants' handwashing practices. Among all handwashing events required before or during meal preparation, only 2 percent included all steps necessary to be considered an adequate handwashing event (defined by the Centers for Disease Control and Prevention's recommended steps).
- Comparing the results for Years 1 and 2, there were no significant differences in terms of handwashing events attempted and successful and unsuccessful handwashing attempts. As in Year 1, the most documented reason for not successfully washing hands was failing to rub hands with soap for at least 20 seconds.

Reasons for Unsuccessful Handwashing Attempts during Meal Preparation

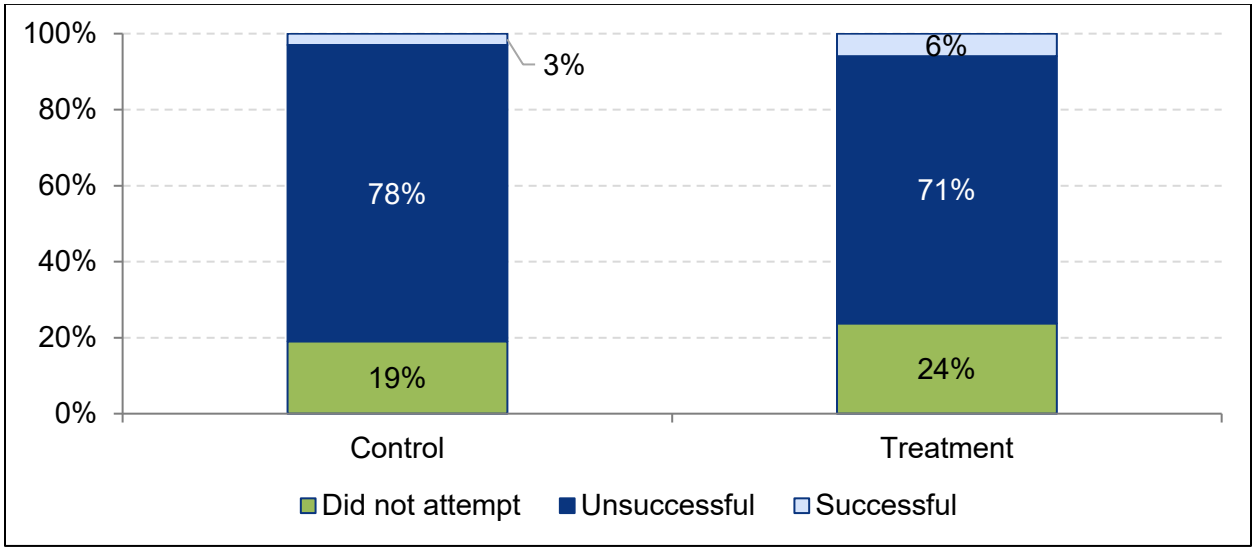


Cleaning and Sanitizing Surfaces and Equipment

- The intervention did not appear to affect whether participants attempted cleaning and sanitizing when required or whether it was successful for the kitchen counter, the sink among poultry washers, and knives or cutting boards used to prepare chicken. There was not a significant difference in successful cleaning and sanitizing events between the control and treatment groups.

- The use of the same cutting board for preparing the chicken and the salad was lower among treatment group participants compared with the control group, suggesting an intervention effect—one of the email messages advised using separate cutting boards for raw meat/poultry and RTE foods.

Cleaning and Sanitizing Counters after Meal Preparation



Cross-contamination and Microbiological Analysis

- The lettuce from the prepared salad was found to be contaminated at a frequency of 26% and 20% for poultry washers and nonwashers, respectively. Hand-facilitated cross-contamination is suspected to be an important factor in explaining this level of cross-contamination.
- High levels of the tracer *E. coli* strain DH-5 alpha detected in the sink and on the salad lettuce suggest that microbes harbored in the sink from chicken, packaging, or contaminated hands are a larger cause for concern than splashing contaminated chicken fluids onto the counter.
- As previously noted, there was no impact on cleaning and sanitizing or handwashing behaviors when comparing the control and treatment groups, but for non-poultry washers, participants in the control group were more likely to contaminate the salad than those in the treatment group, suggesting an intervention effect.

Prevalence of Surrogate Contamination and Level of Contamination for Locations in the Kitchen and Salad Lettuce When Chicken Was Washed

Location		All Participants	Control	Treatment	*p* value[a]
Post-wash inner sink	Prevalence contaminated % (*n*)	60.32 (63)	59.65 (57)	66.67 (6)	.7401
	Level of contamination ± SD, log CFU/g (*n*)	4.49 ± 4.84 (38)	4.49 ± 4.86 (34)	4.47 ± 4.72 (4)	.9938

Location		All Participants	Control	Treatment	*p* value[a]
Post-clean inner sink	Prevalence contaminated, % (*n*)	14.29 (63)	14.04 (57)	16.67 (6)	.8621
	Level of contamination ± SD, log CFU/g (*n*)	4.11 ± 4.55 (9)	4.16 ± 4.58 (8)	1.65 ± NA (1)	NA
Spice container	Prevalence contaminated % (*n*)	6.25 (96)	4.65 (86)	20.00 (10)	.0590
	Level of contamination (SD), log CFU/g (*n*)	2.23 ± 2.12 (6)	2.07 ± 1.99 (4)	2.45 ± 2.41 (2)	.8449
Salad lettuce	Prevalence contaminated % (*n*)	25.77 (97)	26.44 (87)	30.00 (10)	.8108
	Level of contamination (SD), log CFU/g (*n*)	3.09 ± 3.35 (25)	3.05 ± 3.34 (23)	3.39 ± 3.52 (3)	.8703

Notes:
A positive result was any colony that fluoresced under UV when grown on selective media.
(n) = number of samples used in the analysis; SD = standard deviation; NA = unable to calculate p value because of small number of observations

Prevalence of Surrogate Contamination and Level of Contamination for Locations in the Kitchen and Salad Lettuce When Chicken Was Not Washed

Location		All Participants	Control	Treatment	*p* value[a]
Post-clean inner sink	Prevalence contaminated % (*n*)	5.11 (137)	6.98 (43)	4.26 (94)	.5040
	Level of contamination ± SD, log CFU/g (*n*)	3.09 ± 3.48 (7)	3.43 ± 3.66 (3)	2.11 ± 2.23 (4)	.5757
Spice container	Prevalence contaminated % (*n*)	4.89 (184)	7.27 (55)	3.88 (129)	.3305
	Level of contamination ± SD, log CFU/g (*n*)	2.49 ± 2.57 (9)	1.93 ± 1.84 (4)	2.68 ± 2.63 (5)	.6452
Salad lettuce	Prevalence contaminated % (*n*)	19.57 (184)	30.91 (55)	14.73 (129)	.0115
	Level of contamination ± SD, log CFU/g (*n*)	4.86 ± 5.54 (36)	4.48 ± 5.03 (17)	5.04 ± 5.67 (19)	.7570

Notes:
A positive result was any colony that fluoresced under UV when grown on selective media.
(*n*) = number of samples used in the analysis; SD = standard deviation; NA = unable to calculate *p* value because of small number of observations

Thermometer Use

- Forty-seven percent of all participants used a food thermometer on at least one chicken thigh. There were no significant differences between the control and treatment groups.
- In the Year 1 study, 34% of participants in the control group used a thermometer on at least one turkey patty, while in Year 2, 44% of the control group used a thermometer on at least one chicken thigh.

Implications for FSIS Outreach Efforts

Exposure to the email messages on risks of poultry washing encouraged participants not to wash raw poultry; however, more needs to be done to increase adherence to more nuanced recommended practices such as proper cleaning and sanitizing of kitchen surfaces and equipment and proper handwashing. Based on the study findings and previous work in the literature related to risk communication, we recommend that FSIS consider designing food safety messaging that:

- changes the frame of "don't wash your poultry" messaging to focus on preventing contamination of sinks, where fruits and vegetables are often washed;
- clarifies that recommendations to not wash poultry include not rinsing as well;
- emphasizes the importance of both cleaning *and* sanitizing;
- continues to emphasize handwashing and cross-contamination because improvements are needed in these areas;
- uses social media to reach a broad audience quickly; and
- emphasizes USDA's role as a credible source of information.

There is a great deal more to learn about consumer attitudes and behaviors as they relate to food safety, in particular related to actions consumers take to prevent cross-contamination in the kitchen. Understanding these factors will help FSIS create more targeted messaging and incorporate everyday contexts into food safety communications.