



Consumer Handling of Whole Turkeys: Identification of Common Mishandling Practices

ABSTRACT

Campylobacter and *Salmonella* remain leading bacterial causes of foodborne illness and are commonly associated with raw poultry. In addition, poultry, both chicken and turkey, is the most common food associated with foodborne illness outbreaks. Research and education interventions regarding safe handling of poultry have focused on practices around raw chicken and eggs. There is a lack of research regarding consumer knowledge and practices with respect to whole turkeys. The objective of this research was to better understand consumer practices related to preparing and handling whole turkeys. An online survey of 1,310 consumers found commonly reported unsafe practices with respect to preparing, cooking, and handling a whole turkey. Washing a whole turkey before cooking, either always or sometimes, was reported by 90% of participants, and stuffing a turkey before cooking, either always or sometimes, was reported by 57% of participants. The potentially unsafe practice of cooking a whole turkey at a low temperature overnight was reported by a substantial percentage, but not majority, of respondents (23%).

However, consumers appropriately reported holding a turkey for less than 2 hours before serving (93%). Results indicate there is a need for targeted education messages regarding how to safely prepare and cook whole turkeys.

INTRODUCTION

Poultry has been identified as a common source of both foodborne illness outbreaks and sporadic cases of foodborne illness (1, 4, 5, 25). The two leading causes of bacterial foodborne illness, *Campylobacter* and *Salmonella*, are commonly found on raw poultry (26). In addition, a third bacterial pathogen that is a major cause of foodborne illness, *Clostridium perfringens*, is commonly associated with poultry (19, 22). Chai et al. found that in outbreaks with identified pathogens between 1998 and 2012, poultry was the most common food associated with the outbreaks. Chicken and turkey were associated with 94 and 52 outbreaks, respectively, over the 14-year period (4).

Because of the economic and public health burden (23, 24), efforts continue to decrease the association of these pathogens with poultry (26). However, there is a need for

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consumers to understand their role to properly (i) cook raw poultry products to 165°F, (ii) clean to avoid cross-contamination, and (iii) chill leftovers promptly. Efforts to encourage consumers to use thermometers to properly cook poultry have been ongoing for almost two decades (15). In addition, safe handling instructions have been required on poultry packaging since 1994 (30), and although these education methods have shown effectiveness, it has been found that they are not sufficient to ensure proper handling and cooking by all consumers (3, 17). Over the same time that these two education efforts have been in place, *Salmonella* and *Campylobacter* have remained the two leading bacterial causes of foodborne illness (23). A major challenge is that it is not clear what percentage of illnesses caused by poultry and these pathogens is the result of undercooking and what percentage is the result of cross-contamination. Although it has been suggested that cross-contamination by poultry is more problematic than undercooking (16, 18), consumer observation research found that when consumers cooked chicken breasts to what they believed was done, they were not yet at the proper temperature of 165°F (3).

Recent and ongoing research and education efforts have sought to better understand and address knowledge and behavior gaps regarding handling of raw chicken (8, 10, 14). This research has identified unique practices and conditions that might result in increased risk for illness from poultry. These include the common practice of washing raw chicken (6, 10, 11, 12, 13), the presence of pathogens on the outside of raw poultry packaging (2), and potential exposure of young children to raw meat and poultry products in shopping carts (21). Education efforts have been developed and piloted to show efficacy around some of these practices (7, 8, 20). However, most of these efforts have focused on chicken and chicken parts.

Dewaal et al. found that from 1990 to 2003, chicken was responsible for 179 outbreaks and 3,363 cases of illness, whereas turkey was responsible for 88 outbreaks and 5,146 cases of illness (5). Similarly, in poultry-associated outbreaks from 1998 to 2012, whereas the overall number of outbreaks because of chicken was greater, the mean number of illnesses associated with turkey-associated outbreaks was 45, compared with 31 illnesses associated with chicken-associated outbreaks (4). Of the 52 turkey-associated outbreaks, 42% occurred during November and December and 55% of those were caused by *C. perfringens*, compared with only 13% of turkey-associated outbreaks being associated with *C. perfringens* during other months (4). Outbreaks of *C. perfringens* associated with turkey around institutional Thanksgiving meals have also been identified (19, 22). This would indicate that there is evidence of increased foodborne illness around the months when most whole raw turkeys are prepared, both from mishandling, because *C. perfringens* is associated with improper holding temperatures, and potentially from

Salmonella or *Campylobacter*, because of cross-contamination or undercooking.

Formative research in our laboratory identified cooking a whole turkey overnight to be a practice among a subset of consumers (9, 10). Although cooking a turkey overnight may result in a turkey that has reached an appropriate internal temperature, unless the turkey is consumed early in the morning, or thoroughly refrigerated and reheated before serving, there is a great potential for improper handling associated with this practice.

The purpose of this study was to better understand among a cross section of U.S. consumers how they handle a whole turkey with respect to (i) washing raw turkey, (ii) stuffing a whole turkey before cooking, (iii) cooking a turkey overnight, and (iv) holding a turkey after cooking and before serving.

MATERIALS AND METHODS

This study was approved by Drexel University's Institutional Review Board.

Survey development

The final survey consisted of 10 questions. Survey format and most questions were adapted from a previously used survey (10), with the addition of a question about stuffing a turkey before cooking.

All survey questions were entered into the SurveyMonkey™ platform. In this platform, each question was given a response type (multiple choice or fill in the blank). In addition to the response type, each question was coded to not allow participants to skip any of the questions. The completed survey was tested multiple times for errors and accuracy before it was launched and shared with SurveyMonkey's™ panel of participants.

Recruitment and survey administration

Potential subjects were recruited using SurveyMonkey's™ contribute panel. This panel is made up of millions of people from diverse backgrounds in the United States. The survey was launched at the end of December 2017 immediately following the holiday season. Participants from the contribute panel could select to take the survey from either their SurveyMonkey™ dashboard or from an email or text message sent by SurveyMonkey™ inviting them to complete the survey, depending upon the notification settings they selected when they completed their SurveyMonkey™ profile. Responses were populated in SurveyMonkey™. Once participants completed the survey, SurveyMonkey™ automatically donated money to the charity of their choice.

Data analysis

Data was analyzed using Microsoft Excel 2016. Analysis of variance was used to determine statistical significance ($P < 0.05$) between consumers of different demographics.

RESULTS AND DISCUSSION

Participant demographics

The total number of individuals who chose to take the survey was 2,083, and of that number, 598 (28.7%) indicated that they had never cooked a whole turkey and therefore did not qualify to complete the survey. Of the 1,485 that did report having cooked a whole turkey, 137 (9.4%) did not give consent and chose not to participate. Of the remaining 1,314 participants, 4 did not continue with the survey. Demographics therefore are based on the 1,310 participants who reported cooking a turkey and consented and continued with the survey (*Table 1*). Participants were predominantly female (56.4%) and represented a range of consumers with regard to race and ethnicity, with most respondents (72.5%) being Caucasian. The largest group of respondents (34.5%) reported making more than \$75,000 per year, but

14.7% of respondents reported making less than \$25,000 per year, whereas 10.4% of respondents preferred not to report income. Approximately 60% of respondents were between 30 and 60 years old, and respondents were from across the United States (data not shown).

Washing raw turkey before cooking

Most respondents (76.9%) reported always washing a raw turkey before cooking, and 13% reported sometimes washing a raw turkey before cooking. Only 10% of respondents reported the recommended practice of never washing a raw turkey before cooking (*Table 2*). Washing raw turkey was a common practice across respondents of all races and ethnicities and incomes, and no statistically significant difference was found between respondents of different demographics.

TABLE 1. Demographics of participants

Responses	N = 1310 N (%)
Gender	
Male	527 (40.2)
Female	739 (56.4)
Prefer not to answer	44 (3.4)
Race/Ethnicity	
Caucasian	951 (72.5)
Hispanic	91 (6.9)
Black, African American	128 (9.7)
Chinese	22 (1.7)
Asian	49 (3.7)
Prefer not to answer	93 (7.1)
Total Household Income	
Below \$15,000	88 (6.7)
\$15,000–\$24,999	105 (8.0)
\$25,000–\$49,999	251 (19.2)
\$50,000–\$74,999	234 (17.8)
\$75,000 and above	452 (34.5)
Prefer not to answer	180 (13.7)
Age	
18–29	164 (12.5)
30–44	378 (28.8)
45–60	401 (30.6)
>60	323 (24.6)
Prefer not to answer	44 (3.4)

TABLE 2. Reported practice of washing raw turkey prior to cooking

Responses (N = 1310)	Always (N = 1007) N (%)	Sometimes (N = 171) N (%)	Never (N = 132) N (%)
Gender			
Female	573 (56.9)	90 (52.6)	76 (57.6)
Male	402 (39.9)	72 (42.1)	53 (40.1)
Prefer not to answer	32 (3.2)	9 (5.3)	3 (2.3)
Race/Ethnicity			
Caucasian	722 (71.6)	120 (70.1)	109 (82.5)
Hispanic	73 (7.2)	13 (7.6)	5 (3.7)
Black, African American	103 (10.2)	18 (10.5)	7 (5.3)
Chinese	15 (1.4)	5 (2.9)	2 (1.5)
Asian	37 (3.6)	5 (2.9)	7 (5.3)
Prefer not to answer	66 (6.5)	13 (7.6)	7 (5.3)
Total Household Income			
Below \$15,000	71 (7.0)	11 (6.4)	6 (4.5)
\$15,000–\$24,999	82 (8.1)	12 (7.0)	11 (8.3)
\$25,000–\$49,999	190 (18.8)	42 (24.5)	19 (14.3)
\$50,000–\$74,999	175 (17.3)	28 (16.3)	31 (23.4)
\$75,000 and above	348 (34.5)	55 (32.1)	49 (37.1)
Prefer not to answer	141 (14.0)	23 (13.5)	16 (12.1)

TABLE 3. Reported practice of stuffing a turkey prior to cooking it

Responses (N = 1,302)	Always (N = 373) N (%)	Sometimes (N = 372) N (%)	Never (N = 557) N (%)
Gender			
Female	211 (56.5)	195 (53.2)	333 (59.7)
Male	146 (39.1)	172 (46.2)	209 (37.5)
Prefer not to answer	16 (4.3)	5 (1.3)	15 (2.7)
Race/Ethnicity			
Caucasian	260 (69.7)	269 (72.3)	442 (79.3)
Hispanic	31 (8.3)	27 (7.2)	33 (5.9)
Black, African American	38 (10.1)	37 (9.9)	53 (9.5)
Chinese	10 (2.6)	8 (2.1)	4 (0.7)
Asian	19 (5.0)	17 (4.5)	13 (2.3)
Prefer not to answer	30 (8.0)	27 (7.2)	36 (6.4)
Total Household Income			
Below \$15,000	29 (7.7)	28 (7.5)	31 (5.5)
\$15,000–\$24,999	36 (9.6)	28 (7.5)	41 (7.3)
\$25,000–\$49,999	78 (20.9)	74 (19.8)	99 (17.7)
\$50,000–\$74,999	60 (16.0)	75 (20.1)	99 (17.7)
\$75,000 and above	122 (32.7)	122 (32.7)	208 (37.3)
Prefer not to answer	48 (12.9)	45 (12.1)	79 (14.2)

TABLE 4. Reported practice of cooking a turkey overnight

Responses (N = 1299)	Sometimes or Always (N = 302) N (%)	Never (N = 997) N (%)
Gender		
Female	162 (54)	577 (57.9)
Male	122 (40)	405 (40.6)
Prefer not to answer		
Race/Ethnicity		
Caucasian	159 (52.6)	792 (79.4)
Hispanic	35 (11.6)	56 (5.6)
Black, African American	62 (20.5)	66 (6.6)
Chinese	13 (4.3)	9 (0.9)
Asian	10 (3.3)	39 (3.9)
Prefer not to answer	23 (7.6)	68 (6.8)
Total Household Income		
Below \$15,000	28 (9.3)	60 (6.0)
\$15,000–\$24,999	36 (11.9)	69 (6.9)
\$25,000–\$49,999	87 (28.8)	164 (16.4)
\$50,000–\$74,999	54 (17.9)	180 (18.1)
\$75,000 and above	59 (19.5)	393 (39.4)
Prefer not to answer	38 (12.6)	131 (13.1)

Although education efforts have been developed and promoted around the concept of not washing raw poultry (8, 20), these have generally focused on chicken and have not specifically addressed raw turkey, with the exception of a U.S. Department of Agriculture (USDA) blog post (28), which gained considerable media attention when it was posted.

Results of this research, and lack of an education campaign that directly discourages the washing of raw turkey, indicate that this may be an area with a need for new and continued consumer education to reduce the risk of cross-contamination in the kitchens of consumers who prepare raw turkey.

Stuffing a whole raw turkey before cooking

The USDA discourages stuffing a turkey before cooking because of the risk of pathogens surviving in stuffing in the cavity of the bird that does not reach a proper final temperature (28). Given that this is a traditional practice and no education campaigns have been developed to address the USDA recommendation to discourage this practice, there is a need to better understand how common the practice of stuffing a raw turkey before cooking is among consumers. This research found the practice of stuffing a turkey common, with 57% of respondents reporting sometimes or always stuffing a turkey before cooking it. Similar to washing a raw turkey, this

practice was widespread, and no statistical differences were identified between consumers of different demographics. We did not examine whether consumers were aware of the USDA recommendation. Therefore, it is not clear from our research whether consumers were aware of the recommended behavior and disregarded it, or were unaware of the USDA recommendation. There is a need to educate consumers of the risk of stuffing inside of a turkey not reaching a safe temperature and therefore discourage this practice.

Practice of cooking turkey overnight

Formative research with consumers (9, 10) had previously identified the practice of cooking a turkey overnight to be more commonly reported by African American and Hispanic consumers. That research was limited to consumers in Philadelphia, Pennsylvania, so this study sought to identify whether this practice was reported among a larger sample that was representative of consumers across the United States. Only 23% of respondents reported always (5.7%) or sometimes (17.6%) cooking a whole turkey overnight (Table 4). The practice was reported among a range of consumers, with no statistical difference found between consumers of different demographics. A search of the Internet using the term “cooking a turkey overnight” found

TABLE 5. Holding times for turkey before served

Responses (N = 1199)	< 1 hour (N = 719) N (%)	1–2 hours (N = 393) N (%)	3–6 hours (N = 73) N (%)	>6 hours (N = 14) N (%)
Gender				
Female	434 (60.4)	222 (56.5)	35 (48.0)	5 (35.7)
Male	284 (39.5)	170 (43.3)	35 (48.0)	9 (64.3)
Prefer not to answer	1 (0.1)	1 (0.2)	3 (4.0)	0
Race/Ethnicity				
Caucasian	588 (82.0)	265 (67.4)	36 (49.3)	9 (64.3)
Hispanic	39 (5.4)	37 (9.4)	10 (13.7)	3 (21.4)
Black, African American	41 (5.7)	50 (12.7)	20 (27.4)	4 (28.6)
Chinese	7 (1.0)	14 (3.6)	0 (0)	1 (7.1)
Asian	24 (3.3)	14 (3.6)	2 (2.7)	3 (21.4)
Prefer not to answer	54 (7.5)	14 (3.6)	1 (19.2)	1 (7.1)
Total Household Income				
Below \$15,000	46 (6.4)	30 (7.6)	7 (9.6)	1 (7.1)
\$15,000–\$24,999	57 (7.9)	35 (8.9)	4 (5.5)	2 (14.3)
\$25,000–\$49,999	120 (16.7)	92 (23.4)	22 (30.1)	2 (14.3)
\$50,000–\$74,999	132 (18.4)	71 (18.1)	17 (23.3)	2 (14.3)
\$75,000 and above	278 (38.7)	133 (33.8)	16 (22.0)	5 (35.7)
Prefer not to answer	86 (12.0)	32 (8.1)	7 (9.6)	2 (14.3)

multiple websites and videos with recipes and instructions for how to cook a turkey overnight. Recommended cooking temperatures ranged from as low as 170°F to cooking the turkey for 400°F for 30 min followed by cooking the turkey at 250°F overnight. The USDA recommends setting the oven temperature no lower than 325°F when cooking a whole turkey (28). This recommendation is based on the risk of a whole turkey being in the danger zone for more than 2 hours if cooked at a temperature lower than 325°F. In addition to the risk associated with reaching a safe temperature, having a fully cooked turkey ready early in the morning may create an increased potential for temperature abuse. If a consumer cooks a turkey overnight, it would be necessary to either hold the turkey at a temperature above 140°F until consumption or to completely cool the turkey and then reheat it before consumption later in the day. That is, even if a turkey is cooked safely to inactivate heat-labile pathogens that may be associated with the raw product, improper holding of the cooked turkey could result in increased risk for foodborne illness from *C. perfringens* (19, 22, 29). Consumer education that discourages cooking a turkey overnight and stresses the risk of illness from turkey that is held at room temperature for more than 2 hours is needed.

Holding times of cooked turkey

Participants were asked how long they hold a turkey before serving it, after it has come out of the oven. Most consumers (60%) reported holding a turkey for less than 1 hour before serving it, and another 33% reported serving it within 1 to 2 hours of the turkey coming out of the oven. Only 3 and 0.4% of respondents reported holding a turkey for 3 to 6 hours or more than 6 hours, respectively, after it came out of the oven and before serving it. Minimizing the time a turkey is at room temperature is critical to prevent the outgrowth of *C. perfringens*. *C. perfringens* spores can survive the cooking process, and if turkey is not refrigerated within 2 hours, spores may germinate and grow rapidly (29). It is estimated that there are 965,958 cases of foodborne illness because of *C. perfringens* per year (23), and it was identified as the cause of 31% of turkey-associated foodborne illness outbreaks from 1998 to 2012. *C. perfringens* outbreaks over the same period were most commonly associated with food handling errors such as improper holding (4). Although respondents in this research generally reported serving turkey within a safe period, this study did not explore how long turkey was held at room temperature before cold storage of leftovers. There is a need for continued education of consumers to cool leftovers promptly to prevent foodborne illness.

CONCLUSIONS

Despite the availability of education campaigns and recommendations of government and health organizations to not wash raw poultry, it would appear that many consumers are still not aware of this public health message and that it applies to whole turkeys. There is a need for consumer education efforts to expand the message to not wash raw poultry to include

whole turkeys. Similarly, despite the USDA recommendation not to stuff a turkey, most consumers report the practice of stuffing a turkey before cooking. Finally, the practice of cooking a turkey overnight at a low temperature should be discouraged, but there is little research to understand why consumers would cook a turkey in this manner and what message would discourage such a practice. Overall, there is a need for active consumer education around proper preparation, handling, and storage of whole turkeys.

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