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PEER-REVIEWED ARTICLE

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Don't Wash Your Chicken!: A Food Safety Education Campaign to Address a Common Food Mishandling Practice

ABSTRACT

A growing body of research indicates that consumers often wash raw poultry. We describe the development and piloting of food safety education materials to raise awareness and influence consumers to stop washing raw poultry, including four fotonovela/recipe brochures; eight YouTube videos; an animated visualization of cross-contamination/aerosolization; pens; and a Web site. The study used a posttest-only design consisting of four control and four intervention sites where surveys were completed following the 4-week intervention. The intervention group improved ($P < 0.05$) participants' behavior toward not washing raw chicken, their knowledge that washing chicken would not lessen their chances of becoming ill, and their self-efficacy regarding ceasing to wash whole raw chicken. Despite this change, many in both groups remained unaware of the proper way to handle raw poultry and still reported washing it. Although this pilot intervention demonstrates the effectiveness of educational materials to address this practice, it also reconfirms results of emerging research that many consumers are not aware of the proper way to handle raw poultry and suggests a need to disseminate the message more broadly and consistently. Substantial interest in the educational materials, post-intervention, by local and national media suggests continued interest in food safety recommendations on this topic among journalists and the general public.

INTRODUCTION

Foodborne illness remains an economic and public health burden *(24, 25)*. Two of the leading causes of bacterial foodborne illness, *Campylobacter* and *Salmonella*, are commonly found on raw poultry *(2)*. It has been suggested that cross-contamination by poultry creates more problems than under-cooking does *(10, 17)*; however, an observational study found that in addition to cross-contamination, undercooking of chicken was common, with greater incidence when chicken was fried or grilled than when it was oven roasted *(3)*. Formative research in our laboratory indicated

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washing of raw poultry to be a common practice among consumers *(8, 9)*. Similarly, a study of UK consumers found that 41% reported always washing raw meat/poultry, and another 21% reported washing either most of the time or sometimes *(22)*. Sixty percent of Australian consumers reported washing whole poultry, and 40 to 50% reported washing chicken pieces *(27)*. Washing of raw poultry was also found to be prevalent in Estonia, Italy, Spain, India, Korea and Thailand *(11, 12)*. A 2013 national survey in the United States found that almost 70% of U.S. consumers reported washing raw poultry *(13)*.

The United States Department of Agriculture *(1)* and other government organizations around the world *(6, 7)* discourage washing or soaking raw poultry. Washing raw poultry may mobilize and increase the spread of pathogens that are on the surface of the poultry *(5)*, and it remains an inefficient way to remove superficial bacteria *(16)*. Washing raw poultry can result in cross-contamination by creating biologic aerosols *(20, 26)*. Droplets have been shown to be dispersed up to 50 cm in front of a sink and 60 to 70 cm to either side of the sink where chicken was washed *(5)*. Despite government recommendations not to wash raw poultry, and consumer research indicating that many consumers incorrectly wash raw poultry, we could not identify a food safety education campaign addressing this incorrect handling habit. In response to this need, we developed the multimedia *Don't Wash Your Chicken!* education campaign to help disseminate this message to all consumers who handle raw poultry. Research has indicated that food safety and health literacy education programs enriched with multimedia modules (such as web-based or animation tools) help audiences to understand concepts better than traditional educational methods *(29)*. However, we recognize that lack of knowledge is not the sole cause of unsafe food handling; consumers need to overcome barriers to changing behavior *(18, 21)*. Combining multimedia tools, information to help overcome barriers, and social marketing *(14, 19)* allowed us to hold consumers' attention with engaging graphics, distribute appealing chicken recipes, and promote the healthful behavior of not washing chicken.

The goal of the pilot intervention described here was to evaluate the efficacy of the *Don't Wash Your Chicken!* educational materials to improve consumers' knowledge and behavior regarding not washing raw poultry. A posttest-only quasi-experimental design was chosen because we suspected that many consumers engaged in this behavior and might not have prior awareness of the risk of washing raw poultry, and a pretest might have increased their awareness of the desired behavior *(9, 22, 27)*.

MATERIALS AND METHODS

All materials and methods used in this study were approved by Drexel University's Institutional Review Board (IRB). Educational materials were developed at New Mexico State University's research-based educational design studio.

Development of food safety education materials

Don't Wash Your Chicken! was designed as a public health education campaign to help consumers visualize and understand the cross-contamination dangers of washing raw poultry. The educational message was conveyed in multiple formats – a Web site, an animation, videos and print (PDFs)—with these materials being developed by a research-based educational design studio. The Web site (http://www.drexel.edu/dontwashyourchicken/) housed the educational materials (fotonovelas and recipes in PDF format, with videos embedded from YouTube), as well as providing access to additional safe food handling links. A fotonovela has a storyline combined with cartoons and/or pictures that ultimately results in a message or lesson that is conveyed through the story. The fotonovela format was chosen because it provides entertainment for consumers, is eye-catching, and has been shown to be an effective tool to disseminating health information. Four different fotonovelas were created and are available in PDF format on the Web site *(Figures 1–4)*. Each storyline centers around individuals being taught by close family members not to wash raw poultry. The scenarios include consumers of various races, ethnicities, sexes and ages. Storylines revolve around a range of chicken recipes, as well as different "cuts" of chicken, in order to reach a range of consumers and to convey the fact that raw chicken does not need to be washed, regardless of cut (i.e., skinless, bone-in, whole chicken). In addition to the print format fotonovelas, four video mini-dramas were created and posted on YouTube to convey the message in an online format, featuring the same actors and storylines as the fotonovelas. We also created brief cooking videos demonstrating how to safely prepare each of the featured chicken recipes, from raw ingredients to a finished meal. Included in each of these, as well as in a stand-alone 14-second "Germ-Vision" clip, was an animated visualization to help consumers understand aerosolization of bacteria and how cross-contamination of nearby foods can occur when chicken is washed in the kitchen sink.

Pilot intervention

The efficacy of the education campaign was evaluated in a posttest-only quasi-experimental design, because of the novelty of the educational message and materials. Four intervention and four control sites were identified. Intervention sites consisted of three public libraries and a supermarket, which received and displayed fotonovela pamphlets and pens (custom printed with the *Don't Wash Your Chicken!* message and the Web site address) over a four-week period during the spring of 2013. A different fotonovela pamphlet was disseminated to the sites each week. Control sites – four public libraries – did not receive any of the education materials over the same four-week period. Demographic characteristics of the control and intervention sites were generally equivalent and representative of the city of Philadelphia (data not shown).

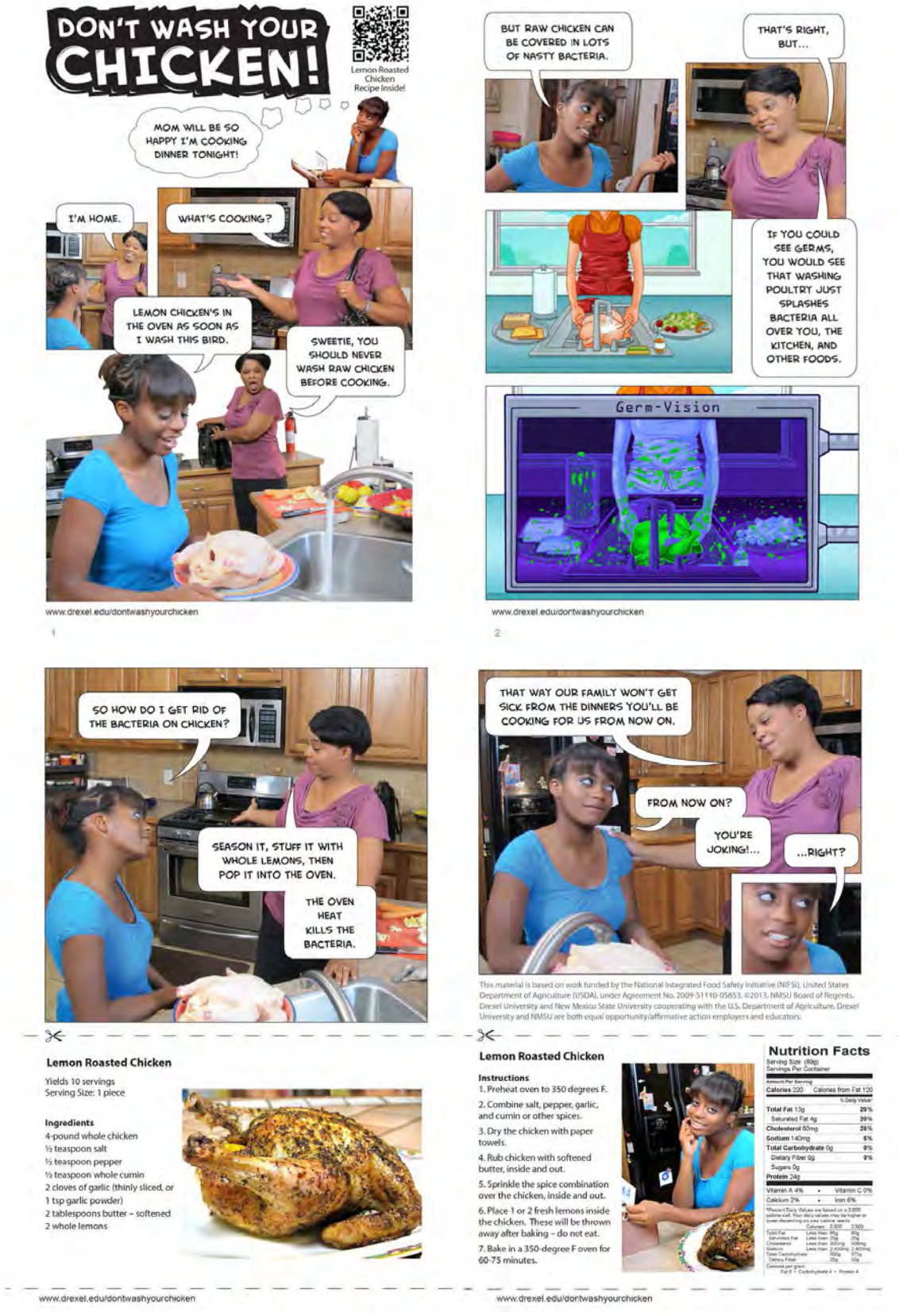

Figure 1. **Don't Wash Your Chicken!** *Lemon Roasted Chicken. One of Four Fotonovelas Developed Utilizing a Storyline to Teach Consumers Not to Wash Raw Poultry*

Figure 2. **Don't Wash Your Chicken!** *Chicken Mole. One of Four Fotonovelas Developed Utilizing a Storyline to Teach Consumers Not to Wash Raw Poultry*

Figure 3. **Don't Wash Your Chicken!** *Oven-Fried Chicken. One of Four Fotonovelas Developed Utilizing a Storyline to Teach Consumers Not to Wash Raw Poultry*

Figure 4. **Don't Wash Your Chicken!** *Stir-Fry Chicken. One of Four Fotonovelas Developed Utilizing a Storyline to Teach Consumers Not to Wash Raw Poultry*

Survey development and administration

Two post-intervention surveys were developed, one for the control group (15 questions), and one for the intervention group (33 questions). Questions were derived from a review of the literature on consumer food safety survey and evaluation questions *(4, 15, 28)*. Knowledge, behavior and self-efficacy questions were consistent between the control and intervention surveys. Additional questions regarding the visibility and appeal of the intervention materials were included in the intervention survey. Response categories included the Likert scale responses, yes/no answers, multiple choice answers and responses to demographic questions. The intervention survey took approximately 5 to 10 minutes and the control survey took approximately 3 minutes to complete.

Immediately following the conclusion of the four-week *Don't Wash Your Chicken!* intervention, researchers administered face-to-face surveys with qualifying individuals, from April 8 to 24, 2013. Qualifying participants at intervention sites were screened to ensure that they: (1) were 18 years or older, (2) prepared meals using raw poultry, (3) had not taken and would not take a University chicken handling survey (so no participant took multiple evaluation surveys), and (4) had visited the intervention site while the education materials were displayed (March 11 to April 7, 2013). Control site participants had similar criteria (#1–3), with the additional criterion that they had not visited any intervention sites while the education materials were displayed.

A predetermined goal of 264 completed surveys each for control and intervention sites (n = 66 surveys per site) was established prior to the campaign's launch. Establishing a survey-goal number ensured that statistical significance ($P < 0.05$) could be obtained during data analysis. Parameters to determine the sample size for the control and experimental groups used an alpha = 0.05, beta = 0.2, power = 0.8, and a Cohn's d (effect size) = 0.25, for a Student's *t*-test. Participants who completed the evaluation survey received a $5 gift card as compensation. Participants who completed the control survey received $2 in cash as compensation.

Data analysis

Data were analyzed using IBM SPSS Statistics version 20.0 (IBM SPSS Statistics, IBM Corp, Somers, NY). Chi-square analyses and independent *t*-tests were used to determine statistical significance ($P < 0.05$), of the differences between the control and intervention groups.

RESULTS AND DISCUSSION

Participant demographics

The demographics of subjects at the intervention and control sites were generally similar and differed ($P < 0.05$) only by race, in that the intervention group had more participants identify as Caucasian (31.8% versus 23.5%) and fewer identified as African American *(Table 1)*. Two hundred sixty-four intervention surveys were completed (n = 66 per intervention site). Of the 442 individuals approached to participate in the evaluation survey, 118 declined to take part and 60 did not qualify, for an acceptance rate of 59.73%. Of the 374 approached to participate in the control survey, 64 individuals declined and 46 did not qualify, for an acceptance rate of 70.59%.

Distribution of education materials among intervention group participants

Throughout the course of the month-long pilot intervention, 2,234 promotional pens (which included the Web site address) and 759 fotonovela brochures were taken. The nine YouTube videos available to the public yielded 808 viewings. The four educational mini-dramas plus the "Germ-Vision" animation yielded 581 viewings, while the accompanying cooking videos were viewed 227 times (cooking videos were not available on YouTube until March 27, 2013). The ability to view the YouTube videos was not limited to those who visited the intervention sites.

Of the 264 participants surveyed in the intervention group, 39.02% reported seeing the education materials. Participants who saw the promotional education materials reported taking home the pens (44.66%) and brochures (stir-fry chicken brochure 21.36%, whole chicken brochure 17.48%, oven-fried chicken brochure 16.5% and mole brochure 11.65%), but rarely engaged with the Drexel Web site or watched the YouTube videos. Of all (n = 264) participants involved in the intervention survey, only 1.89% visited the Web site and 1.52–1.89% watched the YouTube educational-mini dramas and/or cooking videos.

Only those who saw the *Don't Wash Your Chicken!* brochures (n = 86) were asked questions about the campaign title (some participants saw more than one brochure). Among this group, 86.0% felt the title *Don't Wash Your Chicken!* was attention-getting and 77.9% liked the title.

Differences in knowledge, behavior and self-efficacy to not wash raw poultry between control and intervention groups

Two questions addressed participants' knowledge regarding recommendations on washing whole and small cuts of raw poultry *(Table 2)*. Following the intervention, those exposed to the education materials were significantly more likely than those in the control group (13.6%) to know that washing raw poultry (whole and small cuts) would not decrease their chances of becoming ill (25.6%). However, when asked how raw poultry can be made safe if it has bacteria on it, the correct response of "cook it (chicken) thoroughly" was not significantly different between the control (73.4%) and intervention group (66.7%).

Three questions addressed participants' behavior with regard to not washing raw poultry. Consumers in the intervention group reported not washing whole (25.0%) and small cuts (20.1%) of raw poultry more often than consumers

Table 1. Comparison of demographics of participants in control and intervention groups

Variables	Control (n = 264) n (%)	Intervention (n = 264) n (%)
Gender		
Female	141 (53.4)	158 (59.8)
Male	123 (46.6)	106 (40.2)
Race/Ethnicity*		
Caucasian	62 (23.5)	84 (31.8)
African-American	154 (58.3)	118 (44.7)
Other minorities	48 (9.1)	62 (11.7)
Education		
< HS/GED	141 (53.4)	124 (47.0)
College/Grad	112 (42.4)	122 (46.2)
Culinary/Technical/Other	11 (4.2)	18 (3.4)
Age		
18–24	33 (12.5)	31 (11.7)
25–34	51 (19.3)	55 (20.8)
35–44	55 (20.8)	54 (20.5)
45–54	61 (23.1)	50 (18.9)
55–64	39 (14.8)	48 (18.2)
65+	23 (8.7)	24 (9.1)
Don't Know/Refused	2 (0.8)	2 (0.8)
Income		
Below $15,000	51 (19.3)	39 (14.8)
$15,000–24,999	42 (15.9)	36 (13.6)
$25,000–49,999	63 (23.9)	64 (24.2)
$50,000–74,999	21 (8.0)	26 (9.8)
$75,000+	20 (7.6)	39 (14.8)
Don't Know/Refused	67 (25.4)	60 (22.7)

in the control group (16.3% and 9.8%, respectively). There was also a significant difference between the control (5.2%) and intervention groups (15%) to report not washing any kind of raw poultry *(Table 2)*.

Two of the questions assessed participants' self-efficacy, a measure of their belief that they had the ability to/could stop washing whole and small cuts of raw chicken. Consumers who saw the education materials had greater confidence that they could stop washing whole raw chicken (10.9%) and small cuts of raw poultry (11.7%) than those who did not see the education materials (5.8% and 6.3%, respectively).

Transtheoretical model

The transtheoretical model (TTM) of behavior change

Table 2. Post-intervention survey results from piloting of the *Don't Wash Your Chicken!* education campaign

Survey item	Control Group (n = 264) n (%)	Intervention Group (n = 264) n (%)	*P*
Knowledge			
Agreed with statement "Cooking chicken thoroughly will allow it to be safe to eat"	193 (73.4)	176 (66.7)	0.106
I am NOT confident washing/cleaning raw poultry will decrease my chances of becoming ill[a]	36 (13.6)	67 (25.6)	< 0.002
Behavior			
I do not wash whole raw poultry	43 (16.3)	66 (25.0)	0.018
I do not wash small cuts of raw poultry such as thighs, wings, or breasts	26 (9.8)	53 (20.1)	< 0.001
I do not wash any kind of raw poultry	15 (5.7)	40 (15.2)	< 0.001
Self-efficacy			
I am very confident I could STOP washing/cleaning whole raw chicken, turkey, duck, etc. [a]	13 (5.8)	22 (10.9)	0.017
I am very confident I could STOP washing/cleaning … small cuts of raw poultry like boneless and skinless chicken breasts, wings, thighs … [a]	15 (6.3)	25 (11.7)	0.347

[a]Likert scale responses of 1–5 were collapsed. 1 = 1–2, 2 = 3, 3 = 4–5

determines where an individual is in readiness to adopt a healthy new behavior *(23)*. Stages of change in the TTM include pre-contemplation, contemplation, preparation, action and maintenance. Two questions addressed where participants fell in the TTM regarding ceasing to wash raw poultry (data not shown). Following the intervention, very few people were in the action-maintenance phase. The majority of the participants in both the control (91.1%) and the intervention (80.2%) group were in the precontemplation–contemplation stage, demonstrating they were still being introduced to the message to not wash raw poultry.

The research reported here demonstrates the efficacy of the *Don't Wash Your Chicken!* education materials in improving both knowledge and behavior of consumers toward not washing raw poultry. It should be noted, however, that even after the education campaign, large numbers of consumers in our study, in both the intervention and the control group, still reported washing raw poultry, consistent with numbers that have been reported in the literature *(13, 27)*. This is not surprising, since both our formative research *(8, 9)* as well as other research in this area *(22)* has found that a majority of consumers report washing raw poultry, indicating that many consumers are likely just learning what the correct behavior is when it comes to washing raw poultry. That is, they are in the pre-contemplative to contemplative stage of the transtheoretical model, and while some may move to the action phase easily and quickly, it will likely take time and repetition of the message to move many consumers to the action and maintenance phases. There is a great need, therefore, for consumer educators to disseminate the message that the proper way to prepare raw poultry is not to wash it.

Limitations of this research include the passive exposure of consumers to the education materials as well as the use of libraries for dissemination of the material. The researchers tried unsuccessfully to engage supermarkets in displaying

the materials but were told by multiple chain markets that it was not allowed by corporate policy. The one market that did participate was a locally owned independent supermarket. Future research should employ a pre-test/post-test design with an active education component engaging consumers regarding why they should not wash raw poultry. While this would limit the number of consumers exposed to the intervention, it would demonstrate whether an active intervention is more effective than the passive intervention used here. Future research should also explore barriers to consumers' willingness to wash raw poultry so that continued efforts to disseminate the message of the desired behavior may address those barriers.

Beyond its impact on the intervention group, the *Don't Wash Your Chicken!* message has received attention in the national media. After the conclusion of the pilot intervention, the educational materials were released to the press and caught the attention of local and national media outlets. In August, September and October, 2013, *Don't Wash Your Chicken!* was featured on NPR's The Salt, NBC's Today Show, CBS's The Doctors, ABC's The Chew, FOX network news, Slate online magazine, and more than 500 regional TV stations and newspapers. Many of these outlets broadcast the animated "Germ-Vision" visualization of cross-contamination and aerosolization to illustrate the scientific reasoning behind the recommendation. As of May, 2015, this clip has received more than 581,000 views on YouTube, and Drexel's accompanying news video has been viewed more than 254,000 times. *Don't Wash Your Chicken!* continues to attract notice with national and international media. The message also showed up in 2013 and 2014 dissociated from its original packaging: in Oprah magazine, on humorous viral postings on Buzzfeed and the Onion, and in response to an antibiotic-resistant *Salmonella* outbreak. Although we cannot know the extent to which these were derived from the original campaign, it does seem that the public health message *Don't Wash Your Chicken!* has filtered through the media landscape and reached many more consumers than originally planned.

CONCLUSIONS

Despite the 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. The education materials developed and piloted here are effective in changing consumers' knowledge and behavior regarding not washing raw poultry. It is likely, however, that because so many consumers are not aware of the desired behavior, some time and repetition of the message will be required to make a majority of consumers aware of the correct behavior. Additionally, it is likely that some consumers will not want to/feel able to not wash raw poultry because of habit and learned behavior. There is a need to better understand those barriers to adopting the desired behavior and address those barriers with additional/future education campaigns around this subject. Enthusiastic reception of the *Don't Wash Your Chicken!* multimedia education materials by mass media outlets in 2013 suggests that this method of reaching consumers – particularly the animated scientific visualization – may be effective in reaching large audiences.

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All of the education materials created for this project are available online at http://www.drexel.edu/dontwashyourchicken/Videos-Photo-novellas/Overview/. The fotonovelas, animations and videos used in this project were produced in collaboration with Media Productions at New Mexico State University – http://mediaproductions.nmsu.edu and are copyright 2013 NMSU Board of Regents. This research was supported by the National Integrated Food Safety Initiative (NIFSI), U.S. Department of Agriculture, under Agreement No. 2009-51110-05853.

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In Memory

Graham H. Fleet

We extend our deepest sympathy to the family of Graham Fleet who recently passed away. Mr. Fleet was a member of the Association since 1977. IAFP will always have sincere gratitude for his contribution to the Association and the profession.