

Rachel Scanlan¹, Patricia Kendall¹, Elaine Scallan², Marisa Bunning¹

¹The Department of Food Science & Human Nutrition, Colorado State University, Fort Collins, Colorado ²Colorado School of Public Health, Denver, Colorado

Abstract

Fresh produce has become a common vehicle for foodborne illness and several outbreaks associated with cantaloupe have occurred during the last 25 years. The 2011 listeriosis outbreak associated with contaminated cantaloupe from Jensen Farms in southeastern Colorado involved 147 illnesses, 33 deaths, and one miscarriage in 28 states; the median age of affected individuals was 78 years.

To develop viable strategies for improving safe handling of produce and reducing risk of exposure to pathogens, it is important to understand current consumer handling methods related to cantaloupe. In 2012, researchers at Colorado State University (CSU) conducted a national web-based survey ($n = 638$; 168 > 60 years of age) to assess consumer cantaloupe handling practices, particularly among older consumers. Participants were recruited via university Extension offices, senior groups, and various community listservs. Survey questions encompassed demographic information and habits related to purchasing, preparation, and storage practices of cantaloupes; results were analyzed using SPSS. Results from the CSU survey were compared to a paper-based survey administered to pregnant women in Colorado during the 2011 listeriosis outbreak by the Centers for Disease Control and Prevention. Only 45% in the CSU survey reported washing cantaloupes prior to consumption and this practice significantly increased with age ($p < 0.0005$). In both surveys, the most common method of washing was rinsing under water without scrubbing. Most (60%) respondents washed cantaloupes for less than 10 seconds; 53% did not dry cantaloupes after washing. Interestingly, 66% of pregnant women in the CDC study reported cutting the rind completely off cantaloupe before consuming or storing compared to 44% of older adults in our study. Educational campaigns and university outreach programs can use these survey findings in targeted food safety messages for high risk groups to emphasize the importance of washing and safely handling produce to prevent foodborne illness.

Methods

Research Design and Implementation

To determine current consumer cantaloupe handling practices a survey was developed which consisted of twenty-one multiple choice questions. Twelve questions were taken from a Centers for Disease Control and Prevention (CDC) survey given to pregnant women in Colorado after the *Listeria* outbreak associated with cantaloupes, and two questions were taken from a CDC survey administered to the 2011 outbreak cases. Seven additional questions assessed demographics and cantaloupe consumption habits.

The research project was approved by CSU's Institutional Review Board. Content validity of the survey was established by experts in the fields of food safety, nutrition, and microbiology. Test-retest reliability testing was conducted with eighteen participants in a *Strong Women Strong Bones* class.

The cantaloupe survey was available online through Survey Monkey® software from May to August 2012. Paper copies were available upon request.

Participants

Participants ($n = 638$) consisted of adults over the age of 20. An email asking for voluntary participation which included a link to the survey was sent to CSU Extension Agents, CSU Society of Senior Scholars, and the Poudre Valley Health System Aspen Club. To increase responses, the survey link was posted on social networking sites. As shown in Table 1, the majority of respondents were Caucasian females; 26% of participants were over the age of 60.

Methods (con't)

Data Analysis

The Statistical Package for the Social Sciences Software (SPSS Version 20.0, 2011, IBM, SPSS Inc., New York, NY) was utilized for analyzing results. Frequencies were calculated. Demographic characteristics, specifically age and gender, were cross-tabulated with all melon handling questions. Chi-square tests and Kendall's tau-b were used for comparing results with p values less than 0.05 considered statistically significant.

Results

Demographic Profile

Of the 638 respondents, 80% were women. The majority of respondents were Caucasian (92%), had advanced degrees (43%) and had a household income greater than \$91,000 (40%).



Washing and Drying Practices

- Approximately 45% of all respondents reported washing the outside of cantaloupes before cutting into the fruit.
- The practice of washing the outside of cantaloupe significantly increased with age ($p < 0.0005$). While 54% of older adults, those over age 60, reported washing the outside of cantaloupe, only 34.5% of adults age 20-40 washed cantaloupe.
- Among pregnant women surveyed by the CDC ($n = 281$), 38% reported washing cantaloupe.
- Regardless of age, the most common method of washing the outside of cantaloupe was rinsing under water without scrubbing. Rinsing was also the most frequently reported method among pregnant women.
- Although not significant at the $p = 0.05$ level, washing with soap was more common with the older adult population.
- Among those who washed cantaloupe prior to cutting, a majority (60%) reported washing cantaloupes for less than 10 seconds and 53% were not drying cantaloupes after washing.

Table 1. Demographic characteristics of respondents

	n	%
Gender (n = 634)		
Male	128	20
Female	506	80
Age Group (n = 634)		
20-40	207	33
41-60	259	41
>61	168	26
Education (n = 631)		
High school	105	17
College degree	253	40
Advanced degree	273	43
Household Income (n = 610)		
<60,000	209	34
61,000 – 90,000	158	26
>91,000	243	40
Race or Ethnicity (n = 628)		
Hispanic/Latino	29	4
American Indian/Alaskan Native	1	< 1
Asian	7	1
African America/Black	11	2
White	580	92

Results (con't)

Preparation Practices

- Fifty-five percent of females reported cutting the rind off completely, while only 40% of males reported this practice ($p \leq 0.0005$) and a majority of adults less than 60 years of age cut the rind off completely compared to older adults ($p \leq 0.001$).
- Table 2 highlights the difference in preparation practices between pregnant women in the CDC survey and older adults in the CSU study. Pregnant women commonly cut the rind off completely and this practice is less frequent in older adults. Additionally, pregnant women often cut up the cantaloupe all at once, 63%, compared to only 42% of older adults.

Table 2. Cantaloupe preparation among pregnant women, n = 296, and older adults, n = 167

	% Pregnant Women	% Older Adults
When preparing cantaloupe:		
Cut the rind off completely	66	44
Leave the rind on and eat the fruit	12	32
Varies	22	24
When cutting cantaloupe:		
Cut up the entire cantaloupe at one time	63	42
Cut up only part of the cantaloupe	18	42
Varies	19	16

- Few respondents, less than 1%, stored cut cantaloupe unrefrigerated, and most respondents, 88%, stored leftover cantaloupe less than 4 days.

Conclusion

A majority of consumers are not washing cantaloupes prior to consumption and those that are washing the outside of cantaloupes are often using incorrect methods. Given these risky food handling behaviors, it is necessary to improve food safety in the home and develop education materials targeted at high risk groups.

Future studies should address why consumers are not washing produce and studies are needed to determine the most effective method for washing cantaloupes.

References

1. Centers for Disease Control and Prevention. *Multistate Outbreak of Listeriosis Linked to Whole Cantaloupes from Jensen Farms, Colorado*. 2012 September 4, 2012 [cited 2012 October 14]; Available from: <http://www.cdc.gov/listeria/outbreaks/cantaloupes-jensen-farms/>
2. Verrill, L., Lando, A. M., & O'Connell, K. M. (2012). Consumer vegetable and fruit washing practices in the United States, 2006 and 2010. *Food Protection Trends*, 32(4), 164-172.

Acknowledgments

- CDC researchers: Maho Imanishi and Benjamin Silk
- Support provided by the Colorado Agriculture Experiment Station

