

Evaluation of Food Safety Risk Messages in Popular Cookbooks

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Purpose: The purpose of this study was to evaluate the communication of food safety guidance, specifically safe endpoint temperatures and practices to reduce the risk of cross-contamination, in popular cookbook recipes.

Abstract

The United States Centers for Disease Control and Prevention estimates the national burden of foodborne illness to be 48 million annually. Although source attribution is difficult to assign due to reporting limitations, consumer behavior research shows that food handling practices in the home are often risky. Previous research on television cooking shows demonstrates that guidance provided to meal preparers in the home is often incorrect, from a food safety standpoint. The purpose of this study was to evaluate the communication of food safety guidance, specifically safe endpoint temperatures and practices to reduce the risk of cross-contamination, in popular cookbook recipes. Recipes in 27 cookbooks, selected from the New York Times Bestseller lists in dining between 2013 and 2014, have been evaluated. The criterion for recipe selection was the use of raw animal ingredients requiring cooking. Recipes were inspected for endpoint temperature recommendations and cross-contamination risk reduction behaviors. Out of a total of 4198 recipes, 1284 met study criteria of cooking raw animal ingredients. Results showed that, of recipes with USDA safe endpoint temperatures that could effectively be measured, 76.7% gave correct endpoint temperatures. Non-negative and positive food safety behavior messages were provided in 5.8% and 4.2% of recipes, respectively. When endpoint temperatures were not included, authors often provided risky doneness evaluation recommendations, such as time, color, or touch. Popular cookbooks are an underutilized avenue for communicating safe food handling practices and currently cookbook authors are risk amplifiers.

Design

Cookbooks were selected from the New York Times Bestseller List for Food and Fitness from September 2013 to January 2014. Books that focused on dieting and weight loss (unless specifically a cookbook), a specific food category, and books with only vegan recipes were excluded. Books based on a type of eating style were included as long as they focused on preparing meals.

Within each cookbook, recipes were selected if they contained at least one raw animal ingredient (eggs, meat, poultry, or seafood) intended to be cooked. Due to the complexity of recipes and their ingredients, many exceptions to this criterion were developed to best reflect the actual food safety risk when preparing the recipes. The cookbook, chapter, and recipe introductions, in addition to the recipes themselves, were included in the analysis. Any references within the recipes to supplemental information, such as a temperatures guide or risk message, were also included.

Selected recipes were inspected for endpoint temperature recommendations and cross-contamination risk reduction behaviors. They were scored using the rubric in Figure 1.

Figure 1. Quantitative Recipe Scoring System

Score	0	1	2	3	N/A
Interpretation	Absent/no	Present/yes	Cannot be determined/food too small	Positive response may not apply in certain situations	Not applicable (not scored)

Subjective indicators and endpoint temperatures were used to determine correct versus incorrect indicators. Endpoint temperatures were evaluated based on USDA's safe internal cooking temperatures and accepted visual indicators, the USDA FSIS Appendix A: Compliance Guidelines, the 2009 FDA Food Code, and "Cooking Small Pieces of Chicken or Meat – Is a Food Thermometer Necessary?" (Harrison & Andress, 2011). Additional qualitative data was collected on subjective indicators of doneness, risky ingredients, culinary training of the author, the type of cuisine or culture of the cookbook, and the recipe instructions.

Data was collected and analyzed using Microsoft Excel 2011 for Mac.

Results

Analysis showed that 29 out of 52 cookbooks met selection criteria. Further scrutiny of the 30 selected cookbooks noted in the original abstract prior to data completion eliminated an additional cookbook. To date, 27 of these have been evaluated, containing 4198 recipes. A total of 1284 out of 4198 recipes met selection criteria.

Table 1. Correct Endpoint Temperature

Cookbook (n=27)	Number of Scored Recipes That Have an Ingredient with a USDA Safe Endpoint Temperature	Number of Scored Recipes That Give an Endpoint Temperature	Number of Scored Recipes That Give a Correct Endpoint Temperature	Percent of Scored Recipes That Give a Correct Endpoint Temperature
The Blood Sugar Solution Cookbook	11	0	0	0
Wheat Belly Cookbook	17	11	11	64.7
Heart of the Plate	4	0	0	0
Miss Kay's Duck Commander Kitchen	5	0	0	0
Jerusalem	3	0	0	0
Ottolenghi	2	0	0	0
Plenty	6	0	0	0
Pioneer Woman Cooks	7	1	0	0
Pok Pok	12	2	1	8.3
The Chew	14	8	4	28.6
Michael Symon's 5 in 5	18	0	0	0
The Can't Cook Book	13	7	4	30.8
Against All Grain	16	3	3	18.8
The Romney Family Table	6	2	2	33.3
The Art of Simple Food	4	1	0	0
Essentials of Classic Italian Cooking	20	0	0	0
Week in a Day (Rachel Ray)	40	6	4	10
The Pioneer Woman Cooks: A Year of Holidays	12	2	1	8.3
True Food	5	0	0	0
Barefoot Contessa Foolproof	10	5	4	40
The Smitten Kitchen Cookbook	8	4	3	37.5
It's All Good	10	2	2	20
Sunny's Kitchen	15	4	2	13.3
Practical Paleo	16	10	10	62.5
Pioneer Woman Cooks: Food from My Frontier	8	0	0	0
Glada's Feel Good Food	10	5	5	50
Eat to Live	2	0	0	0
All cookbooks	294	73	56	19.0

Table 3. Avoiding Cross-Contamination

Primary Food Category* (n=12 cookbooks)	Use of Separate or Clean Cutting Boards, Utensils, and Dishes for Raw and Cooked Foods	Handwashing After Starting	Handwashing After Touching Raw Meat, Poultry, Seafood and/or Eggs	Use of a Clean/Single-Use Towel for Drying Hands or Cleaning Cooking Equipment, Surfaces, and Utensils	Total Behaviors by Food Category
Ground meat (beef, veal, pork, and lamb)	4	5	0	1	10
Ground poultry	0	0	1	2	3
Beef, veal, and lamb	5	1	2	0	8
Poultry	2	0	5**	0	7
Pork	0	0	0	0	0
Seafood (fish)	1	0	3	0	4
Seafood (shellfish and crustaceans)	3	0	0	0	3
Eggs	0	0	1	0	1
Total Behaviors by Type	15	6	12	3	36

*Some recipes may have demonstrated more than one behavior, and some recipes may have more than one primary food category. Only 12 cookbooks had at least one recipe with guidance to reduce the risk of cross contamination.

**Conflicting cross-contamination behaviors (still counted). Three recipes that demonstrated handwashing after handling raw chicken or using or separate cutting boards between raw and cooked poultry also instructed readers to wash poultry.

Positive food safety messages
Out of 1284 recipes meeting selection criteria, 75 (5.8%) provided overall non-negative food safety behavior messages and 54 (4.2%) provided strictly overall positive food safety behavior messages.

Subjective indicators of doneness
Nearly all (98.9%) recipes gave some type of subjective indicator to determine doneness. The most common indicators were related to cooking time (46.5%), cooking to a non-specific temperature such as cooking completely or simmering (21.7%), and color (14.2%). Time was considered subjective because the time needed to cook a food to a safe internal temperature can vary based on many factors, from the temperature and cooking equipment used to cook the food to individual characteristics of the food itself. Unusual language to explain doneness included phrases like "meltingly," "soft curds," "and totally done."

Pathogens related to foodborne illness
Only 2 cookbooks mentioned any pathogens related to foodborne illness, which were both related to the risk of Salmonella from raw or undercooked egg sauces.

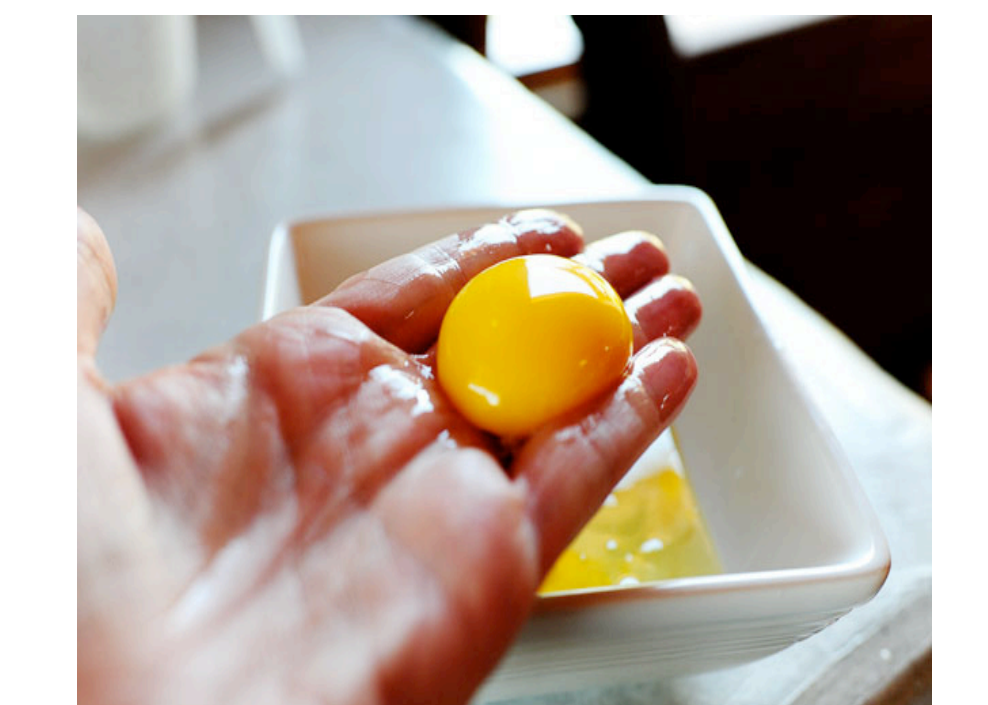
Of recipes meeting selection criteria, 294 contained a raw animal ingredient with a USDA safe endpoint temperature (Table 1). Seventy-three (24.8%) of these could effectively be measured with a digital tip-sensitive instant read thermometer and mentioned an endpoint temperature, which was either correct or incorrect based on USDA guidelines (Table 2). Of those that gave an endpoint temperature, 56 (76.7%) were correct.

Of the recipes that give an endpoint temperature, 51 (69.9%) suggested measuring the temperature with a thermometer.

Table 2. Food Categories for Recipes with Correct vs. Incorrect Endpoint Temperatures

Food Category	Correct	Incorrect	Total Number of Recipes Giving an Endpoint Temperature	Percent of Endpoint Temperatures That Are Correct
Ground meat (beef, veal, pork, and lamb)	4	0	4	100
Ground poultry	3	0	3	100
Beef, veal, and lamb	4	13	17	23.5
Poultry	30	3	33	90.9
Pork	14	0	14	100
Seafood (fish)	1	1	2	50
Seafood (shellfish and crustaceans)	0	0	0	N/A
Eggs	0	0	0	N/A
All categories	56	17	73	76.7

"Take caution in consuming raw eggs because of the slight risk of salmonella or other food-borne bacteria. To reduce this risk, use only fresh, properly refrigerated clean grade A or AA eggs with intact shells and avoid contact between the yolks or whites and the outer shell."
-Against All Grain



Source: The Pioneer Woman Cooks: Food from My Frontier

"Cautionary note: Homemade mayonnaise is made with raw eggs, which may transmit salmonella. I have made it dozens of times without encountering the problem, but if you are concerned about the possibility of salmonella poisoning, and particularly if you are planning to serve the mayonnaise to elderly people, or to very young children, or to someone who is immune deficient, use packaged, commercial mayonnaise."
-Essentials of Classic Italian Cooking

Discussion and Conclusions

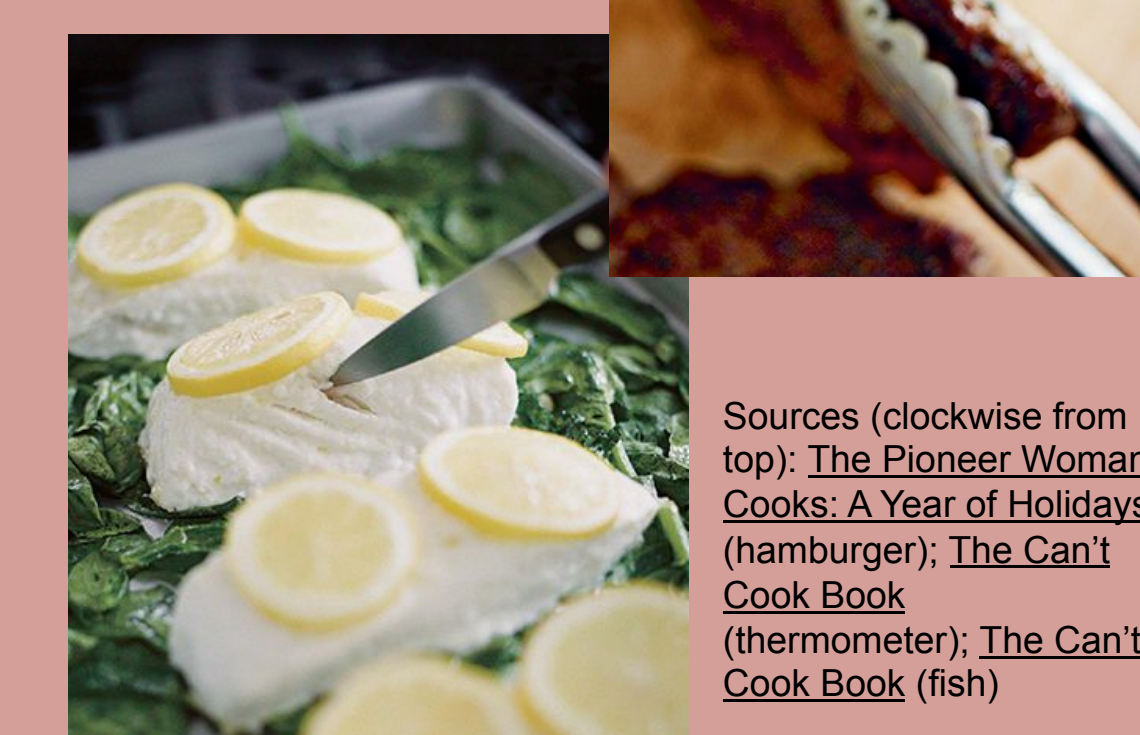
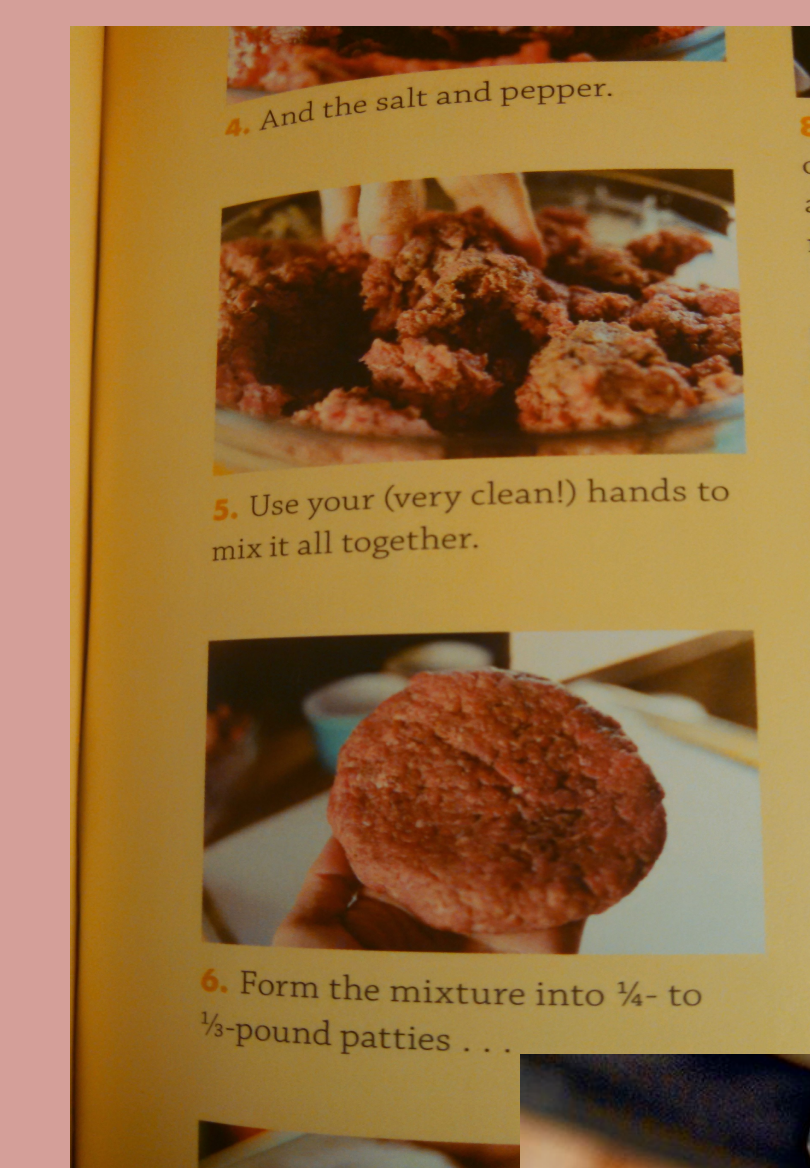
Popular cookbooks are doing a poor job of effectively communicating safe food handling practices. They infrequently provide any guidance related to cooking foods to a safe internal temperature or reducing the risk of cross-contamination. The majority of guidance related to cooking to a specific internal temperature or reducing the risk of cross-contamination was provided for whole and ground meats, pork, and poultry.

Too often the guidance they do provide is incorrect and can actually put readers and those they are serving at a higher risk for foodborne illness. Of the guidance provided, it was most often correct for recipes with whole pork, ground meats, or ground poultry. Occasionally, whole poultry guidance was incorrect, most often because instructions directed the reader to wash their poultry.

Recipe guidance for determining food doneness was highly subjective, as 98.9% of recipes gave some type of subjective indicator to determine doneness. These indicators varied widely and were frequently difficult to interpret. While a small number of these are acceptable indicators of doneness when food is too small or thin to be measured accurately with a digital tip-sensitive instant read thermometer, most are not. From a food safety standpoint, this is a more risky way to determine doneness because some doneness indicators, like the color of ground beef and the color of juices, do not correlate with safe internal cooking temperatures.

The only foodborne illness pathogen warnings were related to Salmonella from raw or undercooked eggs, yet there was little guidance about cooking eggs to a safe internal temperature or reducing the risk of cross-contamination when cooking with eggs.

The results of this study support the conclusions of Griffith, Mathias, and Price (1994) that there is a lack of safe food handling and preparation guidance in popular cookbook recipes and that cookbook recipes are still an underutilized source of food safety information.



Sources (clockwise from top): The Pioneer Woman Cooks: A Year of Holidays (hamburger); The Can't Cook Book (thermometer); The Can't Cook Book (fish)