

# Prevalence of Risky Food-Handling Practices in Restaurants that Serve Hamburgers

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## ABSTRACT

**Background:** Numerous outbreak investigations and evaluations of sporadic cases of *E. coli* O157 have identified hamburgers as a leading cause of infection. Studies have found eating in restaurants to be a risk factor for infection with *E. coli* O157. The purpose of this study was to assess ground beef handling and cooking practices for hamburgers, and to describe the frequency of use of irradiated ground beef in restaurants. **Methods:** Eight EHS-Net sites surveyed 385 restaurants that served hamburgers. Sanitarians conducted an interview and a site evaluation to determine ground beef handling practices and use of irradiated ground beef products. **Results:** In restaurants receiving fresh ground beef, 64% (147 of 228) reported that they never measure the temperature upon delivery. Fifty percent (190 of 383) reported never measuring the final cook temperature of hamburgers. In restaurants where ground beef handling was observed, hands were not washed between handling raw ground beef and RTE foods or cooked ground beef in 49% (119 of 243) of restaurants. Hands were wiped on wiping cloths or aprons after handling raw ground beef (without a handwashing step) in 60% (93 of 234) of restaurants where ground beef handling was observed. The median temperature of cooked hamburgers was 172°F. When asked about irradiated ground beef, only 1% (5 of 384) reported “always” or “sometimes” purchasing irradiated ground beef. Twenty-nine percent (110 of 384) reported that they had never heard of irradiated ground beef. **Discussion:** This survey reveals the pervasiveness of risky ground beef handling practices in restaurants. While use of irradiated ground beef could reduce the risk of these practices, almost no restaurants use the product. These results indicate the need for educational campaigns targeting foodworkers. Training should focus on the importance of hand hygiene, avoiding cross-contamination, and verification of the final cook temperatures of ground beef.

## INTRODUCTION

Foodborne infections with *E. coli* O157:H7 continue to be a significant public health problem in the United States, causing an estimated 62,458 illnesses and 52 deaths per year (1). Outbreak investigations and evaluations of sporadic *E. coli* O157:H7 cases have identified eating hamburger as a leading cause of infection, and recent studies have found that eating in a table-service restaurant is also a risk factor for infection with *E. coli* O157:H7 (2-4).

### Study objectives:

- Assess ground beef handling and cooking practices in restaurants for hamburgers and cheeseburgers, and
- Describe the frequency of use of irradiated ground beef in restaurants.

## METHODS

- This study was conducted by Environmental Health Specialists Network (EHS-Net) members in eight states: CA, CO, CT, GA, MN, NY, OR, and TN.
- Each state was expected to enroll 50 randomly chosen eligible restaurants.
- Eligible restaurants were defined as facilities that prepare and serve hamburgers. Temporary or mobile food stands, institutions, restaurants in supermarkets, and caterers were not eligible for enrollment.
- Only one restaurant from a particular chain was included per state.
- EHS-Net specialists interviewed the manager and observed food preparation areas.
- Site visits were conducted between April 6, 2004 and September 3, 2004.

## RESULTS

### Demographics and food safety policies (Tables 1 and 2)

- Of the 2,645 establishments that were contacted, 778 were eligible, and 390 (50%) agreed to participate.

Table 1. Demographics of study restaurants

	No. (%) of restaurants
<b>Restaurant ownership</b>	
Independent	258 (67)
Chain or franchise	126 (33)
<b>Restaurant type</b>	
Sit-down	290 (75)
Quick-service/fast food	72 (19)
Cafeteria or buffet	24 (6)
<b>Education of manager</b>	
High school grad/GED or less	102 (26)
Some college or college grad	283 (74)
<b>Length of employment in food service industry</b>	
< 5 years	34 (9)
5 to 15 years	99 (26)
> 15 years	252 (65)

Table 2. Self-reported food safety policies of study restaurants

	No. (%) of restaurants
<b>At least one manager food safety certified</b>	
Yes	304 (82)
No	66 (18)
<b>Food workers receive paid sick leave</b>	
Yes	80 (21)
No	296 (77)
<b>Employees required to report GI illness to manager</b>	
Yes	272 (72)
No	108 (28)
<b>Policy to restrict ill foodworkers</b>	
Yes	309 (80)
No	61 (16)
Respondent did not know	15 (4)
<b>Consumer advisory regarding the risk of eating undercooked animal products</b>	
Yes	76 (20)
No	295 (77)
Respondent did not know	12 (3)

### Ground beef preparation policies and practices (Figure 1)

- 64% (147 of 228) of restaurants reported never measuring the temperature of fresh ground beef when it is delivered to the facility.
- 50% (190 of 383) of restaurants reported that they never measure the final cook temperatures of hamburgers.
- Only 1% (5 of 384) of restaurants reported “always” or “sometimes” purchasing irradiated ground beef; 29% (110 of 384) reported that they had never heard of irradiated ground beef.

Figure 1. Self-reported food safety policies in study restaurants

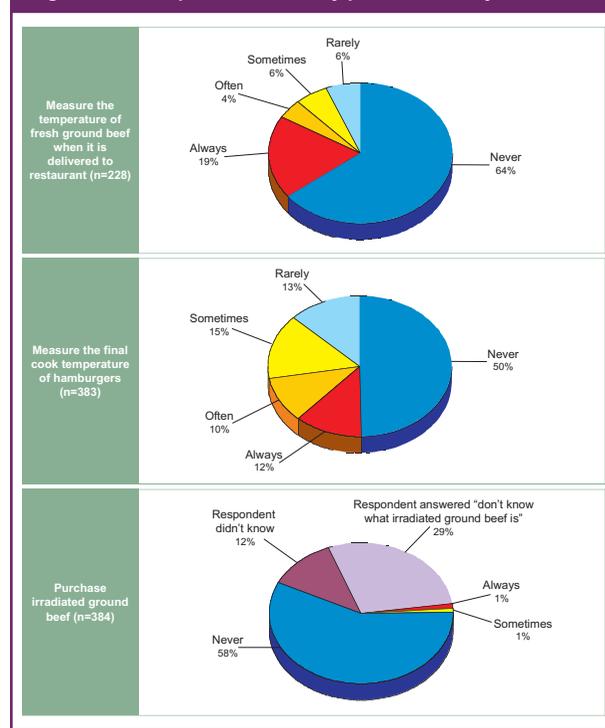
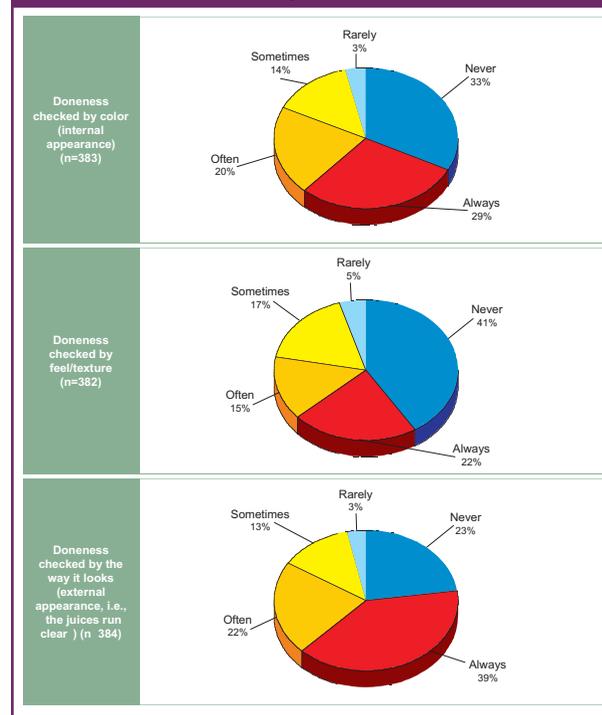


Figure 2. Self-reported ground beef preparation policies in study restaurants

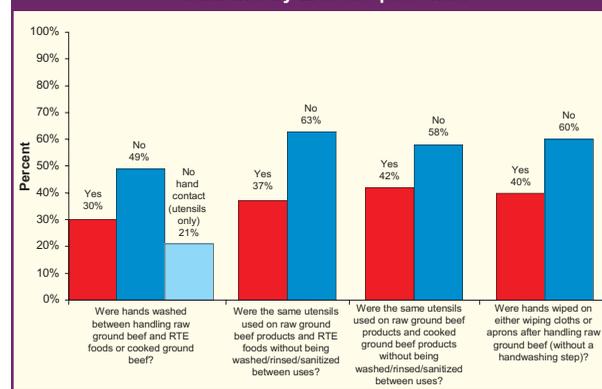


- A high proportion of restaurants reported that they measured the “doneness” of hamburgers by methods other than temperature-taking (Figure 2).

### Observations of food preparation areas (Figure 3)

- Ground beef handling was observed in 243 restaurants. Risky food-handling practices were observed in a high proportion of restaurants.

Figure 3. Risky food-handling practices observed in restaurants by EHS-Net personnel



### Temperatures of cooked hamburgers (Table 3)

- The median temperature of cooked hamburgers was 172°F (range, 113°F to 210°F). For different ordering preferences, the percent of hamburgers cooked to less than 155°F ranged from 6% for medium-well hamburgers to 40% for medium-rare hamburgers.

Table 3. Customer ordering preferences and temperatures of cooked hamburgers

	Customer-requested level of doneness Frequency (%) <sup>a</sup>	Median temperature of cooked hamburger (range) <sup>b</sup>	Undercooked hamburgers Frequency (%) <sup>c</sup>
Medium Rare	15 (6)	158°F (113 – 184)	6/15 (40)
Medium	36 (15)	166°F (128 – 186)	10/36 (28)
Medium Well	68 (29)	174°F (145 – 205)	4/68 (6)
Well	50 (22)	179°F (135 – 210)	4/50 (8)
Preference not considered <sup>d</sup>	65 (28)	177°F (137 – 210)	5/65 (7)
TOTALS	234 (100)	172°F (113 – 210)	29/234 (12)

<sup>a</sup> Question asked of the chef: “How did the customer request this hamburger be cooked?”

<sup>b</sup> Final cook temperature as measured by the sanitarian.

<sup>c</sup> “Undercooked” defined as cooked to <155°F.

<sup>d</sup> Restaurant cooks hamburgers to one level of doneness only and disregards customer requested level of doneness.

## DISCUSSION

- This study revealed the pervasiveness of risky food-handling practices such as poor handwashing after handling raw ground beef, infrequent temperature-taking of cooked hamburgers, and cross-contamination that may facilitate the acquisition of *E. coli* O157:H7 by restaurant patrons.
- The prevalence of these risky food-handling practices validates the association between *E. coli* O157:H7 infections and eating at a table-service restaurant observed in a recent case-control study (3).
- A high proportion of restaurants reported assessing the final doneness of hamburgers by subjective methods. Several studies have shown that the final color of cooked hamburger is not a reliable indicator of doneness (5).
- Educational campaigns targeting foodworkers and managers are needed.
- Training efforts should focus on the importance of avoiding cross-contamination, improved hand hygiene, and verification of the final cook temperatures of ground beef.
- If foodworkers and managers cannot be adequately trained to follow safe ground beef handling practices, the increased use (or mandated use) of irradiated ground beef may help mitigate risky food-handling practices.
- Efforts should be made to inform restaurant owners that irradiated ground beef is a viable option to consider when ordering ground beef supplies.



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