

Supplement

Explaining the Risk of Foodborne Illness Associated with Restaurants: The Environmental Health Specialists Network (EHS-Net)

CRAIG W. HEDBERG*

School of Public Health, University of Minnesota, 420 Delaware Street S.E., Minneapolis, Minnesota 55455, USA

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A foodborne illness outbreak happens when a group of people eats food that is contaminated with a sufficient dose of a disease-causing agent. Illness may result because the food is contaminated with an agent that can cause illness after a small number of organisms are consumed or because the food was mishandled in a way that allowed a large number of organisms to grow. Because restaurants bring people together for shared food experiences, they provide opportunities for both types of contamination events to occur and be recognized. Almost half of reported foodborne illness outbreaks in the United States occur in restaurant settings (4).

The Environmental Health Specialists Network (EHS-Net) was established to conduct research and surveillance that would contribute to a greater understanding of the risk of foodborne illness associated with restaurants and to translate knowledge of how and why outbreaks occur into improved prevention practices (7). For the past decade, EHS-Net's federal and state partners have systematically explored restaurant policies and food handling practices that have led to the occurrence of outbreaks (7–9). Several important features of the interplay between policies and practices have emerged from early studies. Restaurants with certified kitchen managers had lower odds of having an outbreak, had fewer outbreaks associated with bare-hand contact of food, and had fewer norovirus infection outbreaks (7). Approximately half of restaurants that prepared breakfast egg entrees pooled eggs before use, a practice that could allow one contaminated egg to contaminate a large batch (9). Pooled eggs also were held a median of 4 h or longer before use, frequently at temperatures that would allow growth of *Salmonella* in the pooled eggs (9).

Similarly, half of restaurants using cut tomatoes held them for a median of 4 h at temperatures that would allow growth of pathogens such as *Salmonella* and *Escherichia coli* (8). These findings are important because norovirus, *Salmonella*, and *E. coli* caused almost 80% of foodborne illness outbreaks with a known or suspected etiology in the United States during 2009 and 2010 (4).

In this issue of the *Journal of Food Protection*, four additional EHS-Net articles help complete the picture of food handling practices in restaurants (1–3, 5). Although temperature control throughout the production and distribution of foods is critical for limiting the growth of foodborne pathogens such as *Salmonella* or *E. coli* O157:H7, 65% of restaurants that received fresh ground beef reported that they never used a thermometer to measure the temperature of the product when it was delivered (1). Similarly, only 7.5% of kitchen managers reported ever rejecting a shipment of leafy greens because it was above the recommended temperature (5). However, half of leafy green shipments observed during the study were above the recommended temperature of 41°F (5°C) when received (5).

Any growth of pathogenic bacteria on raw products before they reach a restaurant increases the risk for contamination of environmental surfaces and other foods in the restaurant. Among restaurants handling raw chicken, 40% of kitchen managers did not usually designate separate cutting boards for raw meat only (2). In 62% of restaurants where raw ground beef was handled with bare hands, no hand washing was observed between handling of the raw ground beef and cooked ground beef or other ready-to-eat foods (1). These and similar practices allow pathogens from a few raw ingredients to contaminate a wide range of food items.

Cooking is the final control point for meat and poultry products, and the U.S. Food and Drug Administration (10) has established final cooking temperatures needed to kill foodborne pathogens. However, only 46% of kitchen managers reported using a thermometer to determine when chicken had reached its final cook temperature, and only 12% reported always using a thermometer to check the final cook temperature of hamburgers (1, 2). Many restaurants may have developed cooking systems to ensure that foods are thoroughly cooked. However, the advisability of determining doneness based on actual temperature was demonstrated by the observation that 8% of “well done” hamburgers were undercooked, with an internal temperature <155°F (68.3°C) (1).

* Author for correspondence. Tel: 612-626-4757; Fax: 612-626-4837; E-mail: hedbe005@umn.edu.

By studying how a wide range of foods are handled in restaurants, the EHS-Net has determined that various food safety hazards are likely to be present. However, the hazard that may represent the greatest risk for foodborne disease transmission involves ill food workers (3). Twenty percent of food workers interviewed in 2008 admitted to working one or more shifts during the previous year while they were experiencing vomiting or diarrhea. Restaurant workers' fear of losing their job and not wanting to leave co-workers short staffed were two significant motivations for working while ill (3). Because infected food workers were identified as the source for half of foodborne norovirus infection outbreaks in the United States from 2001 through 2008 and may have contributed to transmission in over 80% of these outbreaks, eliminating the motivations of workers to work while ill should be a clear priority (6).

The EHS-Net has established a systems-based approach to evaluating food handling practices in restaurants. This approach has allowed identification of combinations of practices that promote contamination with and growth and survival of disease-causing agents in food served to restaurant patrons. Policies that address these hazards and practices to control them need to be established. Workers need to be trained to understand and value the policies and demonstrate proficiency in the practices, and workers need to be supervised by kitchen managers certified in food safety. Doing all of this is the key to reducing the burden of illness associated with foodborne transmission of pathogens such as norovirus, *Salmonella*, and *E. coli*.

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