

# Conditions causing burn injuries in foodservice workers

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## Abstract

Minor occupational burn injuries are common among foodservice workers. Risk factors and interventions to prevent these injuries, however, have not been well elucidated. The goal of this study was to determine the workplace conditions that put foodservice workers at risk for such burn injuries. A chart review of patients who presented to an ambulatory clinic located in a large metropolitan airport in the US with burns from handling food was conducted. This was followed by workplace visits of multiple food vendors and aircraft. The majority of burn injuries identified were scald injuries to the hands and upper extremities, and occurred primarily while handling coffee and from splashes of cooking oil. Contact burn injuries were also common, involving the use of hot equipment or incidental contact with nearby equipment. Mechanisms of injury and root causes were explored. Measures for preventing these painful, potentially disfiguring and time-losing occupational injuries are suggested.

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## Background

According to the Centers for Disease Control and Prevention (CDC), burns are among the most common injuries for foodservice workers (CDC 1986, 1993; Inancsi & Guidotti 1987, Lyngdorf 1987, Hayes-Lundy *et al.* 1991, Hendricks & Layne 1999, Hunt & Calvert 2000, Riina *et al.* 2000; Suzman *et al.* 2001). While the majority of occupational burn injuries do not require hospitalization (CDC 1993; McCullough *et al.* 1998; Baggs *et al.* 2002), they can be extremely painful, result in superinfection, leave hyperpigmented areas on the skin or result in a disfiguring scar. These minor to moderate burn injuries may also lead to lost or limited work time.

A review of the literature reveals that while the risk of burn injury to foodservice workers is frequently high, the risk factors for minor to mod-

erate burns have not been well studied compared to more severe burns. For example, one published report utilized outpatient medical records from ambulatory clinics from a large European city (population: 500 000) and found that among all occupational burn injuries, 'scalds and contact burns were dominant, particularly in restaurants' (Lyngdorf 1987). The author noted that the working process of 'cooking' led to the majority of these burns, and that the kitchen was the location of highest risk of burn injury. This study however did not go further to define specific behaviors in the cooking process that led to the burn injuries.

Another study of minor occupational burns, this time utilizing a North Carolina state injury database, similarly reported that foodservice personnel were among the highest at risk of burn injury (Hunt & Calvert 2000). Though the data

did not permit further analysis of underlying risk factors, the authors stated that an in-depth investigation of burn injuries in foodservice was needed to identify specific mechanisms of injury (Hunt & Calvert 2000).

This study will examine underlying mechanisms of moderate occupational burn injury in foodservice workers and suggest possible preventive measures.

## Methods

A daily log of patients who presented to an outpatient health center located at a large, metropolitan airport in the US was used to identify burn cases over a 4-year period from 2002 to 2005. There were 203 total burn injuries logged, of which 88% were available for analysis. Of these, 130 were cases of occupational injury, and 97 of these cases involved an employee who worked in foodservice. Data related to demographics, mechanism of injury and burn outcome were recorded from four sources: the intake sheet, the physician narrative and physical examination and the patient narrative from the Worker's Compensation form. Based on these descriptive data, workplace visits and key informant interviews of foodservice personnel were conducted. The vendors and aircraft selected for investigation were chosen by availability and convenience and were not keyed to specific injuries. Key informants were identified and interviewed at the time of the walk-through visit or by the authors when they accompanied injured employees at the clinic. Data were entered into a Microsoft Access database and analyzed in Microsoft Excel (Microsoft Corp., Redmond, WA).

## Results

### Basic demographics

Of the 97 occupational burn cases to foodservice workers, 77% were female, with an average age of 33 (range 16–64 years). The cases could be divided into two broad occupational groups: those working as airport food vendors and those working as airline employees. Table 1 shows the frequency and percentage of burn injury by job

**Table 1** Frequency and percentage of burn injury by five most common job titles

Job titles	<i>n</i> (%)
Food vendor employees	
Cashier	34 (35)
Cook	14 (14)
Server	13 (13)
Kitchen crew	7 (7)
Customer service representative	3 (3)
Airline employees	
Flight service attendant	13 (13)
Cabin service	1 (1)
Cabin clerk	1 (1)
Customer service	1 (1)
Cashier	1 (1)

title for the five most prevalent job titles in each group. Cashiers were the most commonly injured among the food vendors, and flight attendants were the most commonly injured on aircraft. Of all burns, 85% occurred to the hand or upper extremities ( $n = 41$  hand,  $n = 44$  upper extremity). About half of all burn injuries were first degree ( $n = 48$ ), and the remaining were second-degree burns ( $n = 49$ ), with no third-degree burns found.

### Mechanism of injury

Scald injury was the predominant mechanism, with 78 total cases (80%), and could be divided between two main media: coffee ( $n = 58$ ) and hot oil ( $n = 13$ ). Contact injury occurred in 21% of all cases ( $n = 21$ ). Underlying patterns of injury circumstance were most evident among the coffee-related injuries. In several of these cases ( $n = 17$ ) no circumstance could be identified from the record; however, the most common identifiable circumstances were: the cup of served coffee being tipped over ( $n = 15$ ), coffee spilled during removal of a filter from the coffee machine ( $n = 9$ ), a spill occurring due to the employee being bumped by another employee ( $n = 8$ ), mispour from the serving container to the coffee cup ( $n = 7$ ) and coffee cup leak with subsequent injury ( $n = 5$ ).

Scald injuries due to hot oil ( $n = 13$ ) were most commonly attributable to the manipulation of the

fries basket within a deep fryer ( $n = 7$ ). Four cases occurred from tripping and falling against the deep fryer, causing a splash, and two cases occurred when an object fell into the grease, leading to a splash.

Contact injuries were typically not described in enough detail to determine the circumstances or behaviors leading to the contacts. These injuries, however, were notable in that all 20 cases occurred exclusively to the hand or distal extremity. The device contacted was frequently mentioned, but did not show any predominant pattern or trend by type. However, while half of the cases involved contact with hot equipment being used by the employee at the time of injury, the other half involved inadvertently contacting nearby equipment that was not being used at the time of injury.

### Walk-through observations

Observations made from food vendor visits in the airport terminal showed that many of the work areas were narrow, corridor-like spaces where many employees worked and frequently bumped into each other or bumped stationary equipment. Floors were sometimes wet or sticky, and sometimes there were supplies blocking the path. Many of the coffee machines had lights that went on when the coffee was done dripping; however, there was still excess water in the machine, and spills could occur. In the machines without lights, a substantial amount of hot water was seen to be splashing out when the filters were removed. Fryers were not covered, and in one vendor, the salt and pepper shakers were located on a shelf above the fryers, which had led to burn injury in the past. A couple of workers who were interviewed noted that they had experienced two burns to their arms several months apart, using the same equipment. They described reaching into an oven and lifting, such that the dorsum of the wrist touched the inside of the hot oven. Because they had not sought care for both burns, this trend would not be reflected in the clinic database. Many of the key informants stated that they had been given some form of training to prevent burns. The content, language of instruction, timing or reinforcement techniques were not investigated in this study.

## Discussion

In this study, foodservice work led to 75% of all occupational burn injuries that presented to a major airport's on-site clinic over a 3-year period from 2002 to 2005. The injuries occurred to various foodservice workers, including such job titles as Food Server, Cook, Cashier and Flight Attendant. This spectrum of burn injury might be expected at any major airport clinic, considering the wide array of food vendors commonly found in this setting. Furthermore, the low to moderate severity of the burns seen at this airport clinic is a result of its ambulatory nature, and not due to a lack of more severe injury in this setting. (More severe burns were presumably transported to a nearby major medical facility and not captured in the clinic database.) Despite their narrow occupational focus and minor to moderate severity, this database of burn injury proved useful because it contained physician and patient narratives of injury that gave insight into the underlying circumstances that led to the injury.

This study has revealed that the spilling of coffee, splashing of cooking oil and inadvertent contact with nearby hot equipment were the most common underlying mechanisms leading to burn injury in this particular population of airport foodservice workers. Analysis of injury narratives along with subsequent interviews with key personnel and workplace walkthroughs led to further insight into the underlying issues leading to burn injury. Based on the sum of these observations, preventive measures were recommended and are divided below by type of injury.

### Coffee spills

The most common circumstance leading to scald injury was the tipping over of a cup of coffee. There were several circumstances that allowed the cup to tip over, and they suggested the following preventive measures: use of broader based cups, use of a designated counter for served cups and use of coffee-cup covers aboard airplanes.

The task of removing the filter from a commercial coffee machine was found to pose a uniquely specific hazard of spill in this study. It appeared from employee narratives that the filters were difficult to manipulate and often retained hot unfil-

tered water even when the machine signaled completion of the brewing process. This led to spillage of the water over the brim of the filter as it was removed. Redesign of the coffee filter to lock it in place until retained water is allowed to cool might help prevent these injuries. Also, safety training aimed at carefully compensating for this design issue could be introduced.

### Grease splashes

The splash of grease or hot liquids onto an employee was common, and typically occurred with use of a deep fryer. Manipulation of the french fries basket within the deep fryer appeared particularly prone to splash, and this suggests a possible redesign of the baskets to reduce the risk of splashing. Splash guards or covers might reduce such injuries. Training designed to minimize the types of behavior that allow for the splash of hot grease from the deep fryer might also be effective.

### Inadvertent bumps/contact with hot equipment

Cramped conditions, common to airport food vendors and airplane compartments, may be the primary factor leading to bumps from fellow employees and inadvertent contact with hot equipment. While it may be difficult, if not impossible, to change the physical shape of the workspaces, it may be possible for trained safety experts to review work traffic patterns and trip hazards and make suggestions for best use of these spaces. Furthermore, interviewing the workers could lead to solutions to this problem.

Burns due to direct contact with hot equipment were notable for occurring *exclusively* to the hand and distal upper extremities, even when the contact was inadvertent. It is possible that the use of protective gloves that include protection for the forearm could reduce such injuries, particularly for those injuries in which hot equipment is knowingly being utilized. It is unclear if the use of gloves would make certain activities more difficult to accomplish, and a consultation with workers would be necessary to allow the introduction of an acceptable, effective glove. Spatulas and other pan removal tools also should be evaluated for use in particular job tasks.

### Limitations

There are several important limitations of this study. First, the population studied is from a unique environment, within an airport, and the results may not be generalizable to foodservice workers in other settings. Second, the records did not include precise information on several variables, such as race/ethnicity, burn severity, long-term morbidity (such as scarring or disfigurement) and the amount of limited or lost work time incurred by injured employees. Third, due to the generally minor nature of burns presenting to this clinic, it is possible and likely that many burn victims from food vendors did not seek care from the clinic, limiting how well the data represents the full picture of occupational burn injury in this setting.

### Conclusions

While various population-based studies have established the high frequency of scald burns to the upper extremities of foodservice workers, recurring circumstances underlying such injuries often have not been fully described. Understanding of such circumstances provides an opportunity to suggest targeted preventive measures relevant to the population being studied. This study focused on minor occupational burn injury to airport foodservice workers, using patient records, key informant interviews and workplace investigations. The data revealed that burns in this population are most commonly caused by the spilling of hot coffee, hot oil splash injuries and inadvertent contact with nearby hot equipment. Recurring circumstances underlying these injuries, such as frequent tipping over of coffee cups and spills due to coffee filter removal, allowed for the suggestion of preventive measures that target these issues. This information can help focus programs that are aimed at reducing burn injury in airport foodservice workers.

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