

An observational study of food safety practices by street vendors and microbiological quality of street-purchased hamburger beef patties in Trinidad, West Indies

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ABSTRACT: There has been minimal study on the food safety practices by street-food vendors in Trinidad, West Indies and little is known on the microbiological quality of street-purchased hamburgers. Microbiological analysis was conducted on 27 beef patties. Most (80.1%) vendors sold hamburgers from readily removable units. Only 10% of vending units had access to running water and refrigeration. Few (30%) vendors displayed their food handler's badge. Most wore hair restraints. Doneness of beef patties was judged solely by appearance. In all cases, the assemblage and serving of hamburgers was facilitated by the use of tongs. No to low microbial risk was noted in samples for 81.5% *Salmonella*, 71.4% *Staphylococcus aureus* and 96.3% *Escherichia coli* of samples. The presence of foodborne pathogens posed some potential risks to consumers.

Key words: Trinidad, street vendors, hamburger beef patties, microbiological quality, food safety

INTRODUCTION

The Food and Agricultural Organization defines street foods as ready-to-eat foods and beverages prepared and/or sold by vendors and hawkers, especially in streets and other similar public places (Simopoulos, 2000). Street foods provide ready-to-eat and fairly inexpensive priced snacks and meals for a wide variety of people (Arambulo *et al.*, 1995; Taylor *et al.*, 2000). According to Scott and Gravani (2003), temporary food service, such as mobile unit may operate on a more regular basis, but unlike modern food service establishments operate under less than optimum conditions.

With a population of about 1.26 million in Trinidad and Tobago (Tradeport, 2003), and a well-established and growing middle class, there is a ready demand for convenience foods. Within the last 5 years, the sale of hamburgers has become popular by street vendors. They are usually sold from mobile units and are often consumed at the point of purchase. The price of a hamburger could vary between US75 cents to US \$ 3.5 depending on size and type of patty. One of the frequent problems in the sale of street foods is their actual and potential hazard caused by bacterial contamination (Muñoz de Chávez *et al.*, 2000). The Caribbean Epidemiology Centre (CAREC, 2002) reported that there were 2597 reported cases of foodborne illness in 2000 and 1905 cases in 2001

(as up to 8th February, 2001) for CAREC member countries. The Centers for Disease Control (CDC), Atlanta has estimated that about one-third of the inhabitants in the United States acquire a food borne disease annually (Griffiths, 2002). A rise in notified cases of food poisoning has occurred across most of Europe and North America; in particular, in the incidence of microbial food poisoning of animal origin (Miles *et al.*, 1999). Over 2 million cases of foodborne diseases occur in Canada each year, many of the cases consist of mild symptoms and are often mistaken for the 'stomach flu' (Halton Regional Health Department, 2001). A recent newspaper article with caption 'Bad Food - Handling Practices in T & T (Trinidad & Tobago)' highlights the public concern (Express, 2003). Also, a recent recall of processed meat products by a leading food processor in Trinidad, West Indies reflected the need for safe and sanitary handling of foods.

Generally, research indicates that food safety is not a factor, which influences the public's choice when selecting an eating establishment (Leach *et al.*, 2001). Food choice is often influenced more by psychological interpretation of product properties than the physical properties of products themselves (Rozin *et al.*, 1986) and food quality has been an important factor (Lewis, 1981). Consumers often

use their senses in their descriptions of safe food, and feel that food that looks or smells bad should not be eaten (Seward, 2003). They cannot tell the risk of incurring a food-borne illness at the time of purchase or consumption of a food item, because the extent of microbial contamination or the level of chemical residues cannot be observed (Roberts *et al.*, 2003). Fearing food-borne illness, some consumers may cut purchases of certain food items or avoid consuming them altogether (Roberts *et al.*, 2003). Consumers need to make informed choices about their food and how it is handled and prepared. Therefore the objectives of the study were to observe food safety practices among street vendors and to microbiologically analyzed hamburger beef patties.

1.0 METHODOLOGY

1.1 Observation of vendors in trade

An observational study was used in the assessment of food safety practices (food preparation, cooking and serving) by street-vendors during their trade. Presence of public and sanitary utilities was determined e.g running pipe-borne potable water versus stored water in containers, availability of toilets, adequate washing facilities, electricity, cool/refrigeration storage at vending units. The exterior of the vending premise was assessed (no litter, some litter, a lot of litter). The appearance of vendors was noted e.g whether head gears and aprons were worn and display of food handler's badge. The source of beef patties was investigated (whether commercially bought or self-made).

1.2 *Beef patties* Twenty -seven hamburgers were bought from different vendors located in the

northern, central and eastern regions of Trinidad, West Indies. These vending points were located at major streets. Beef patties were purchased, being the popular type of hamburgers by consumers. No condiments (e.g ketchup, mayonnaise, mustard, pepper sauce or toppings such as tomatoes, onions) were requested. On purchase of the wrapped (grease-proof paper) hamburgers, they were packaged in polyethylene bag and refrigerated. Sampling was conducted on the first week of October and ended on the last week of November, 2003.

1.3 Microbiological analysis

Beef patties were analyzed after aseptic removal from the bread/bun component of hamburgers. Table 1 shows the microbiological media used for detection of total aerobes (Difco Laboratories, Detroit Michigan) staphylococci, salmonella and *Escherichia coli* (Oxoid Ltd, Basingstoke, London, UK). Microbiological analysis was conducted according to APHA (1998) using the pour plate method. Each analytical unit was taken from a larger sampling unit (~ 100g) and homogenized (Stomacher, Lab blender model 4001, Seward Medical, London, England) in 90 ml of buffer solution (0.1 % peptone water, Oxoid Basingstoke, Unipath England) for 1 min. Triplicate agar plates with 30 and 300 colonies were counted and the ranges and mean counts were reported as cfu/g and converted to log₁₀ cfu/g. Beef patties were considered as no to low risk having total count of less than 5.0 log₁₀ cfu/g, <2.0 log₁₀ cfu/g for *E. coli* and *S. aureus* and zero tolerance/25 g for salmonella (Speck, 1976; APHA, 1992).

Table 1- Media and incubation conditions for microbiological analysis of beef patties

| Microorganisms | Media | Temperature, °C; time of incubation |
|---------------------------|---------------------------|-------------------------------------|
| Total aerobic plate count | Plate count agar | 36±1.0 for 48 hr |
| <i>Staphylococci</i> | Mannitol salt agar | 36±1.0 for 48 hr |
| <i>Salmonella</i> | Brilliant green agar | 36±1.0 for 48hr |
| <i>Escherichia coli</i> | Eosin methylene blue agar | 36±1.0 for 24 hr |

2.0 RESULTS & DISCUSSION

2.1

Mobile units and access to utilities

Most vendors (80.1%) plied their trade from readily removable stalls (easily towed away by a light vehicle or on wheels) which were partially enclosed units (wooden, plastic and of aluminum-zinc sheets) located on main streets. Approximately 10 % of vendors had accessed to running water, electricity and toilet. Most brought their supply of water in buckets, water containers or coolers from home or collected water from a near-by-public stand-pipe. Washing of hands, utensils and dishes was often done in buckets or bowls. Due to the lack of electricity at vending unit, in most cases (90.0%), there was also no refrigeration/cooling facility. Permanent vending units (10%) were equipped with fly-proof food serving zones. Otherwise the food was kept covered in plastic containers or by cloth. Generally, the immediate surroundings were clean (no litter) and garbage bins were provided for waste disposal. However, in some instances, stray dogs were seen in the vicinity. In most instances, the hamburgers were purchased by consumers to be eaten at another location (due to the lack of seating facility). According to USDA's 1994-96, Continuing Survey of Food Intakes by Individuals (CSFII), about 34% of hamburgers consumed in the United States are consumed at home. 17% eaten in restaurants, 51% eaten at fast food establishments or cafeterias/residential dining and 8% eaten at other locations (Ralston *et al.*, 1996).

2.2 Vendor's appearance

Most vendors (57%) were females. In the East-West and Northern regions, most vendors (93.4%) wore clean clothing. Women wore hair nets or head ties, white aprons over their dresses or skirts. Male vendors (80%) wore head gears but were attired in usual clothing. In the central region, only 50% of vendors had their heads covered and most wore usual clothing. To sell food to the public in Trinidad, food service operators are required to have approved food badges issued by the Public Health Authority of the Ministry of Health of Trinidad and Tobago in certification of good health. Few (30%) vendors displayed their food handler's badge as required. In a recent household consumer food safety study conducted in Trinidad, some consumers bought from food vendors who did not display food handler's badge (4.8% bought always; 35.7% bought 'sometimes') (Surujlal and Badrie, 2003).

2.3 Hamburger beef patties

Most vendors (90.0%) bought their pre-made beef patties in bulk from a local supplier. Others prepared their own patties from ground beef, eggs, bread crumbs (filler) and seasoned with locally grown herbs such as chives (*Allium schenoprasum* L), onion (*Allium cepa* ssp. *cepa*) and shado beni or cilantro or bhandaniya (*Eryngium foetidum*). These self-made beef patties were sold at a higher price, as they were found to be more tasty than commercial beef patties. In a survey of hamburger patties (Huffman *et al.*, 1981), consumers examined the desirability of a variety of attributes of hamburgers and found a difference only for flavor. In a USA study on consumer food safety behavior, taste preferences were more important than motivation to avoid foodborne illness (Economic Research Service/USDA, 1996). The pre-cooked commercial beef patties were stored in sealed plastic containers or covered with cotton kitchen towels. Only about 13% of vendors cooled their beef patties in ice boxes. Beef patties were pre-cooked and then grilled before serving.

2.4 Cooking and serving of hamburgers

In all instances, pre-formed beef patties were grilled for about 2 to 3 min on flat iron plates, which were heated mainly by propane gas or electricity. Beef patties were sandwiched between hamburger bread/bun, wrapped in grease-proof paper and served to consumers. According to Killinger *et al.* (2000), consumers often believe that a brown internal color indicates that a patty is fully cooked. The Food Safety and Inspection Service, the Food and Drug Administration, and the Centers for Disease Control and Prevention recommend that consumers use a thermometer to cook hamburgers to 160°F (71°C) (USDA/ FSIS, 1998a), with no reference to internal color. Research has shown that color is not a reliable indicator of ground beef patty doneness (thoroughly cooked) as there may be premature browning and persistent pink color (Killinger *et al.*, 2000; USDA/FSIS 1998b; Berry and Stanfield, 1993; Mendenhall, 1989). Premature browning is a food safety issue, because patties appear fully cooked (brown), even though they have not reached an internal temperature sufficient to kill pathogens (Hague *et al.*, 1994). The recommendation to use a thermometer may help retain desirable palatability characteristics in safely cooked hamburger (Economic Research Service/USDA, 1996). Altekruise *et al.* (1996)

reported that in a national telephone survey of US residents between December 1992 and February, 1993, 67% knew that cooking meat until well done reduces the risk of food poisoning, and 71% served adequately cooked hamburgers at home.

All hamburgers were assembled by the use of tongs. Most Trinidadian household consumers (96.4%) felt that the use tongs was necessary in serving foods (Surujlal and Badrie, 2003). According to NRA (2002), all food handlers should use tongs, scoops or other utensils to dispense food for customers. Some vendors did not have holding containers to place utensils such as tongs and often place them on bare counter tops. Grills were often cleaned between orders by scraping with the same hand equipment that facilitated grilling. Scraps were discarded through make-shift vents and placed in garbage bins. It was observed that none of the vendors allowed their hands to be in direct contact with the beef patties, bread or assembled hamburgers. The toppings and dressings for hamburgers were stored at ambient temperature (29°C - 32°C) and sometimes to direct sunlight.

2.5 Microbiological quality

Table 1 shows that most beef patties posed zero to no microbial risks i.e were within the acceptable limits i.e. < 5.0 log₁₀ cfu/g for total aerobes; <2.0 log₁₀cfu/g for *S. aureus* and *E. coli* and zero tolerance for 25g sample for salmonella. During the handling, packaging, or serving of cooked

products, some low level of contamination invariably occurs on the surface of the products from equipment and food handlers (Johnston and Tompkin, 1992).

Improper preparation and handling of foods at food service establishments are primary factors in *Salmonella* outbreaks (Jay, 1992). During weeks 1 - 52, 2002, there were 49 cases (as of January 16, 2003) of salmonellosis in Trinidad and Tobago (CAREC, 2003).

Some beef patties (14.8%) showed absence of *S. aureus*. The presence of small number of *S. aureus* is not uncommon (Adams and Moss, 2000). Human contact with cooked food invariably adds *S. aureus* at levels 10¹ or 10² to many sample units (Surkiewicz, 1973). Such levels are harmless but offer sufficient inoculum for growth (Johnston and Tompkin, 1992). The detection of *S. aureus* in beef patties, could have resulted result from food handlers, animal or environmental sources (Lancette and Tatini, 1992). In processed foods, in which *S. aureus* is destroyed by processing, its presence usually indicates contamination from the skin, mouth or nose of food handlers. An average prevalence of 19.8% *S. aureus* was found in 10 ready - to - eat consumer food types sold in Trinidad (Adesiyun, 1995). Also, in this study revealed that out of 37 black pudding samples tested for *S. aureus*, 27 samples (73.0%) showed detection.

Table 2 - Microbiological analysis of beef patties

| Microbial type | % detected | Mean log ₁₀ cfu/g (Range - log ₁₀ cfu/g) | No risk to low risk % |
|------------------------------|------------|---|--------------------------|
| Standard plate count | 100 | 4.1 (2.0-5.0) | 100 |
| <i>Salmonella</i> | 18.5 | 3.1 (ND - 4.2) | 81.5 |
| <i>Staphylococcus aureus</i> | 85.2 | 3.9 (ND - 5.2) | 74.1 |
| <i>Escherichia coli</i> | 11.1 | 1.1 (ND - 2.5) | 96.3 |

ND- not detected

Table 1 shows that most (96.3%) beef patties posed no to low risk for *E. coli* Unavoidable contamination usually will add coliforms at levels 10¹ or 10² per gram to the surface of the product (Johnston and Tompkin, 1992). The presence of coliforms on the surface of properly cooked meat products indicates post-process contamination *E.*

coli presence indicates possible insanitary conditions and warrants investigation of the condition of preparation (Speck, 1976). Also, human contact may sometimes introduce *E. coli*.

There are critical control points to preventing foodborne illness such as preventing cross - contamination from the raw products to ready-to-

eat, using adequate times and temperatures for cooking, avoiding recontamination after cooking by surfaces previously contaminated with the raw meat, and properly chilling and storing meat after cooking. Emphasis must be placed on cooking hamburgers to 160°F (71°F) before consumption. In addition, food vendors must practice clean hygienic practices to ensure food safety. Consumption of undercooked hamburgers has been identified as a risk factor for infection from *E. coli* 0157:H7 (Slutsker et al., 1998). Further cooking of hamburgers thoroughly may prevent other illness as well, because ground beef can also be contaminated with other pathogens such as *Salmonella*, *Campylobacter* and *Staphylococcus*. In a telephone survey of 100 Oregon food preparers, found that 56 % of the respondents knew that they could cook food contaminated with *Salmonella* to make it safe; and 59% knew this for *E. coli* (Woodburn and Raab, 1997). Altekruise et al. (1996), found that respondents who were able to specify a food vehicle for the transmission of *Salmonella* sp. were more likely to report taking food safety precautions. They pointed out that a basic knowledge of microbiology may motivate consumers to use safe food - handling practices

3.0 IMPLICATIONS OF THE STUDY

The presence of microbial pathogens in some beef patties could pose a potential health concern to the consuming public. Overall the study highlighted the need for effective communication on microbiological food risks, proper instruction and supervision in food handling procedures, greater consumer/vendor education on transmission of enteric food - borne diseases and food safety risks, how safely to cook and serve foods and more vigilant monitoring by food inspectors and control staff.

ACKNOWLEDGEMENTS

The authors thank Ms. Vidhya Bridgebassie, Mr. Esau Mohammed and Mr. Chris Garcia for technical assistance at the Microbiology laboratory, University of the West Indies, Trinidad and Tobago, West Indies

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