

Bacteriological Quality of Traditionally Prepared Fried Ground Beef (*Dambun nama*) in Sokoto, Nigeria

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Abstract: The study was designed to determine the bacterial quality of local fried ground beef (*Dambun nama*) sold and consumed in Sokoto metropolis. Between January and December 2009, 216 samples of fried ground beef were collected and processed for bacterial isolations. Plate count agar, Violet Red bile lactose agar, RAPID *E. coli* agar and tellurite emulsion plates were used for the isolation of aerobic mesophiles, coliforms, *E. coli* and *S. aureus*. The total mesophilic aerobic count from the 216 samples was between 6.70×10^8 and 9.30×10^9 CFU.g⁻¹ with a counts of 4.5×10^9 CFU.g⁻¹. The prevalence of 100, 49.5 and 36.6% were obtained for aerobic mesophiles, faecal coliforms and *E. coli* respectively, while a prevalence of 69.9% was recorded for *S. aureus*. The rate of isolation of bacterial organism and the colony-forming unit per gram (CFU.g⁻¹) from the samples were higher than the acceptable limits. Therefore, the product is unsafe for human consumption.

Key words: Bacteria, ground beef, quality, safety, sokoto

INTRODUCTION

Food safety depends on their adequate manipulation, transportation and storage. Foods are not sterile, in the sense that they normally contain germs (bacterial, Viruses, yeast and molds), some of which can lead to food intoxication and infections when present above the acceptable levels (Frazier and Westhoff, 1978).

Meat and meat products are sometimes contaminated with germs after leaving the manufacture plant. In most cases contamination is due to inadequate manipulation. Hygiene conditions are poor when foods are produced in non-industrial establishments, mainly due to lack of required equipment for adequate processing. Those susceptible to food infections and or intoxications are children, elderly and immunosuppressed individuals (Stagnitta *et al.*, 2006). While food borne diseases remain an important public health problem worldwide, one of the most significant food safety hazards is associated with foods of animal origin (Mead, 1994).

Dambun nama is a significant portion of the diet of a large active population in Northwestern, Nigeria. This product is usually sold as ready to eat meat products within the metropolis. The product is made principally from beef, mutton and camel meat in this part of the country. The meat is boiled with or without addition of salt, pepper, parley, garlic and onion depending on local preparation and consumer request. The boiled meats are

then grounded in a mortar, and fried in vegetable oil. The product is then allowed to cold to room temperature; pepper, parsley and garlic are added post frying and mixed thoroughly. The products are sold in various sizes of plastic canisters, displayed at ambient temperature for sale along side raw meats.

Scientific studies have documented the antimicrobial properties of some spices, herbs and their components (Mei-Chin and Wen-Shen, 2002; Sara, 2004; Shelef, 1983; Zaika, 1980). Other studies have reported that spices and herbs themselves may be highly exposed to bacterial contamination, based on conditions in which they were grounded. Moreso, contaminated spices have been reported to cause foodborne illness and spoilage (Kneifel and Berger, 1994; Pafumi, 1986).

The purpose of the study was to determine the bacterial quality of local ground beef (*Dambun nama*) sold and consumed in Sokoto metropolis.

MATERIALS AND METHODS

Between January 2009 and December 2009, a total of 216 fried ground beef (*Dambun nama*) samples purchased at different retail outlets located in and around Sokoto metropolis were processed. The samples were taken to the veterinary public laboratory of Usmanu Danfodiyo University, Sokoto and processed immediately or stored at 4°C for less than 24 h. A portion (2.5gm) of each

sample was placed aseptically into a separate sterile stomacher bag containing 22.5 ml of 0.1% sterile peptone water and homogenized in a stomacher. The suspension was then serially diluted at ten fold in 0.1% sterile peptone water for bacterial analyses. These suspensions were seeded in different culture media.

Counts of mesophilic aerobes were done in plate count agar incubated at 37°C for 24 h. Only those plates containing 30 and above colonies were considered for the counts. The bacterial counts were obtained by multiplying the mean number of colonies by the inverse of the dilution. Results were reported as colony-forming units per gram of samples (CFU.g⁻¹) as described by Feng *et al.* (1998).

Faecal coliforms counts were carried out on violet Red bile lactose agar incubated at 44°C for 24 h. Colonies were considered as round red to pink. *E. coli* counts were carried out on RAPID *E. coli* agar. Typical colonies were considered as violet to pink. Presumptive *E. coli* colonies were checked for Gram reaction and characterized by Kligler test.

Staphylococcus aureus counts were carried out on tellurite emulsion plates and incubated at 35°C for 24 to 48 h. Typical colonies (black surrounded by Clear zones) were considered positive.

RESULTS AND DISCUSSION

The prevalence of the different bacterial from this study is shown in table 1. The total mesophilic aerobic counts from the 216 samples ranged between 6.70 x10⁸ and 9.30x10⁹ CFU.g⁻¹, with a mean count of 4.5x10⁹ CFU.g⁻¹. The prevalence of aerobic bacteria was 100%. The counts of faecal coliforms in the 216 samples ranged between 10³ and 10⁵ CFU.g⁻¹, 109 (49.5%) of the samples were positive. Out of the 216 samples, 79(36.6%) were positive for *E.coli* and counts ranged between 10² and 10⁵ CFU.g⁻¹. *S. aureus*, was isolated from 151 (69.9%) of the samples with counts ranging between 10⁵ and 10⁷ CFU.g⁻¹.

The evaluation of bacterial agents can be a good indicator of the bacterial quality of meat food products, as aerobic flora has been used as criteria to predict the mean life of products. The microorganisms can be used as indicators of inadequate product manufacturing and /or handling. There are no available regulatory standards for the microbiological safety criteria for locally (non-industrial) prepared read to eat foods to compare with our findings. However, to evaluate the hygienic quality of the samples studied our results were compared to Moroccan regulatory standards for microbiological safety criteria for foods (Moroccan Department order, 2004). According to these regulations, the aerobic plate counts, faecal coliforms, *S. aureus*, should not exceed 5.7, 2 and 2 log CFU.g⁻¹ respectively in raw ground meats. In our study

Table 1: Prevalence the bacterial isolates from *Dambun nama*

Isolates	Number positive (%)
Aerobic mesophiles	216(100)
Faecal coliforms	107(49.5)
<i>E. coli</i>	79(36.6)
<i>Staphylococcus aureus</i>	151(69.9)

all the samples were from traditionally processed products and the total aerobic counts far exceed the prescribed microbiological safety limits. This is so because the products are produced in a non-industrial premise. The implication of the findings is that the product is not safe for human consumption, since all the samples (100%) were positive for aerobic counts exceeding the acceptable limits.

The prevalence of *E. coli* in this study was 36.6%, which is higher than previously reported in roasted beef (*Suya*) and roasted poultry meat in the same study area (Magaji *et al.*, 2002; Abdulkadir *et al.*, 2007). The prevalence of *E. coli* in this study is however, lower than 90% reported in Johannesburg (Meara *et al.*, 1977), and 58.26% from gound beef in Argentna (Stagnitta *et al.*, 2006). The average count of 2.2x10⁴ CFU.g⁻¹ recorded was higher than 1.4±0.6 log CFU.g⁻¹ previously reported by Scanga *et al.*, 2000). Counts of *E. coli* that exceed the limits established by regulations have been frequently reported throughout the world. Most of the enterobacteria present in meat come from faecal contamination. The isolation rate of 69.9% for *S. aureus* was however higher than previous reports (Magaji *et al.*, 2002; Americh *et al.*, 2003; Abdulkadir *et al.*, 2007; Nozha *et al.*, 2008).

The high bacterial counts from the products (*Dambun nama*) from this study is generally attributed to the filthy environment, poor personal hygiene of the processors, retailers and the use of contaminated utensils during processing, packaging. There could be possible cross contamination of the finished product from adjacent raw meat through unclean hands of the handlers and/or flies. The addition of spices and hot season after processing may have significantly increased the amount of bacterial flora in the meat products. This is because the spices may be contaminated with variety of bacterial organisms. Contaminated spices have been reported to cause foodborn illness and spoilage of food (Kneifel and Berger, 1994; Pafumi, 1986).

The finding from this study is of serious public health concern, as most of the isolates have been reported to cause various health problems (Foodborne infection and intoxications) in humans. There is the possibility of transfer of resistant properties to the consumers, if antibiotic resistant organisms are ingested with the products. There is the need to enlighten the producers and retailers of the product on the importance of environmental and personal hygiene at all times, to display finished products separately from raw meats.

The findings from this study imply that the product (*Dambun nana*) is unsafe and constitutes a food safety risk to the numerous ever-increasing consumers. If measures are not put in place, there may be a possible outbreak of food poisoning and or foodborne infections due to consumption of the contaminated product (*Dambun nana*). This may lead to serious economic and public health problem.

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