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S. WALIULLAH AND C.R. AHSAN



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## ASSESSMENT OF MICROBIOLOGICAL QUALITY OF SOME MEAT-BASED FAST FOODS COLLECTED FROM STREET VENDORS

S. WALIULLAH<sup>1</sup> AND C.R. AHSAN<sup>2</sup>

<sup>1</sup>Masters student, Department of Microbiology, University of Dhaka, Dhaka-1000, Bangladesh; <sup>2</sup>Professor, Department of Microbiology, University of Dhaka, Dhaka-1000, Bangladesh.

Corresponding author & address: Sumyya Waliullah, E-mail: wsumai@gmail.com

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### ABSTRACT

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The microbiological quality of three popular meat-based fast foods such as chicken sandwich, chicken burger and hot dog collected from street vendors around Dhaka University were investigated in this study. The conditions of storage of the fast-food samples were also observed. Total viable bacterial count (TVBC) of lettuce portion of chicken burger exceeded the microbial quality limit but all other portions of different foods were acceptable. Total coliform count (TCC) of bread portion of chicken sandwich, chicken burger and hot dog were found to be  $3.3 \times 10^5$ ,  $2.0 \times 10^5$ , and  $6.9 \times 10^2$  cfu per g, respectively and were found to be unsatisfactory. TCC of minced chicken of chicken sandwich and chicken burger were found to be  $8.1 \times 10^3$ ,  $1.0 \times 10^2$  cfu per g, respectively, which was also unacceptable. No pathogenic bacteria including *Salmonella* were found in any sample. The results of microbiological assessment in the laboratory and the corresponding questions that were asked to the food handlers and food servers also suggested that the microbial safety of the investigated fast foods depends not only on the environmental conditions but also on the personnel hygiene. These results also indicate poor microbiological quality of the meat-based ready-to-eat fast food items sold on the streets.

**Key words:** fast food, quality, microbiology

### INTRODUCTION

Fast food is a kind of food that is hot, ready-to-eat, delicious, and easy to serve and mouth watering. Food with proper nutritional value, hygienic in quality and appropriate in quantity is essential for good health and active life (Potter 1978). Fast foods are most popular among the teenagers and aged persons as well as in all over the country. As the fast food gets popularity, fast food shops are much rooming across the city and urban areas of many developing countries including Bangladesh.

Fast foods, ready-to-eat are gradually getting popularity and hence a huge number of fast shops are growing even without concerning of microbiological safety and hygiene (LeBaron *et al.* 1990). It increases the risk of different food borne infections for the fast food consumers. From the public health point of view, it is essential to monitor the microbiological safety and quality of various fast foods along with their safe handling, processing, storage and distribution. A considerable number of studies on the quality of fast foods and fast food restaurants with respect to the outbreak of many gastrointestinal and other related diseases have been reported in many countries of the world (Begum 1985; Sami and Bari, 1986; Jafor 1998).

Therefore the aim of the present study was to assess microbiological safety and quality of three popular meat-based fast foods such as: chicken sandwich, chicken burger and hot dog in which portion of a fast food contain major bacterial load also identified.

### MATERIALS AND METHODS

#### *Samples*

A total of 12 samples of chicken sandwich, chicken burger & hot dog from Nilkhet (Gausul Azam Market), Shahbag (Aziz Super Market), Dhaka University (Cafe Campus, DUS) were collected aseptically.

#### *Culture Media*

The bacterial count was performed by standard method (Anon. 1998). Total viable bacterial count (TVBC) was done by the standard plate count method following the method described by Sharp and Lyles (Sharp and Lyles, 1969) using nutrient agar (NA). MacConkey Agar (MAC) was used for the detection of coliforms & fecal coliforms, Xylose-Lysine-Deoxycholate (XLD) agar for isolation of *Salmonella* sp. and for *E. coli* Eosin Methylene Blue (EMB) agar was also used.

#### *Identification of microorganisms*

Bacterial isolates were identified by their microscopic, cultural and biochemical characteristics according to the Bergey's Manual of Systematic Bacteriology.

#### *Information from food handlers*

A set of questionnaires was asked to the food handlers for additional supports of the investigation about hygienic conditions of the fast food shops. In every case at least 3 food handlers were asked. Their answers were then analyzed and compared with the laboratory findings.

## RESULTS AND DISCUSSION

The standard plate count (SPC) in different meat-based snacks is summarized in Table 1. Foods suspected to cause food poisoning gave higher count ranging from  $10^6$  to  $10^7$  per gram of food (Hobbs *et al.* 1953).

Table 1. Standard plate count (SPC) of different meat based fast foods

Food items	Portions of food item	Total viable bacterial count (cfu/g)		Total coliform count (cfu/g)		Average TCC (cfu/g)	Total <i>Salmonella</i> count (cfu/g)
		Lowest	Highest	Lowest	Highest		
Chicken sandwich n=4	Only bread	$1.0 \times 10^3$	$2.1 \times 10^5$	$1.0 \times 10^2$	$1.32 \times 10^4$	$3.3 \times 10^3$	No <i>Salmonella</i> was found
	Only minced chicken	$3.1 \times 10^2$	$6 \times 10^5$	$1.2 \times 10^1$	$3.2 \times 10^4$	$8.1 \times 10^3$	
	Total sample	$1.5 \times 10^3$	$3 \times 10^5$	$2.1 \times 10^3$	$2.0 \times 10^5$	$1.01 \times 10^5$	
Chicken burger n=4	Only bread	$1.8 \times 10^3$	$5.84 \times 10^5$	$4.3 \times 10^4$	$7.8 \times 10^3$	$2.0 \times 10^3$	
	Only minced chicken	$2.41 \times 10^2$	$5.61 \times 10^4$	nil	$4.0 \times 10^2$	$1.0 \times 10^2$	
	Only lettuce	$1.59 \times 10^4$	$2.34 \times 10^7$	$5.2 \times 10^2$	$7.34 \times 10^5$	$3.67 \times 10^5$	
	Total sample	$2.36 \times 10^4$	$3.32 \times 10^6$	$1.3 \times 10^1$	$3.0 \times 10^4$	$1.5 \times 10^4$	
Hotdog n=4	Only bread	$2.4 \times 10^3$	$3.2 \times 10^6$	$2 \times 10^1$	$3.5 \times 10^3$	$6.9 \times 10^2$	
	Only minced beef	$3.2 \times 10^2$	$4.2 \times 10^4$	nil	nil	nil	
	Total sample	$4.5 \times 10^3$	$5.2 \times 10^6$	$1.2 \times 10^2$	$5.2 \times 10^4$	$2.6 \times 10^4$	

Table 2. The answers to the questionnaires asked to the food handlers during collection of the food samples

Area	No. of persons	Hand washing			Proper dressing			Personal cleanliness			Education		
		yes	no	nc	yes	no	nc	yes	no	nc	yes	no	nc
1. Dhaka University (Cafe Campus, DUS)	7	2	4	1	1	5	1	3	4	0	1	6	0
2. Nilkhet (Gausul Azam)	10	7	3	0	4	4	2	3	4	3	3	7	0
3. Sahbag (Aziz Super Market)	9	8	1	0	4	5	0	5	4	0	5	4	0

nc= no comment

The bacteriological condition of different portions of food samples was studied where, the total viable and the highest bacterial count of most of the food samples were within acceptable range but not satisfactory. The highest count was  $2.34 \times 10^7$  cfu/g in lettuce portion which was unacceptable and the lowest count was  $2.41 \times 10^2$  cfu/g in minced chicken portion. Both the highest and lowest count was found in same sample of two different portion of the chicken burger (lettuce portion and minced chicken portion). It indicated that chicken burger sample contained a variety of bacterial load. Viable count of minced chicken portion of chicken burger and minced beef portion of hot dog were the lowest  $2.41 \times 10^2$  and  $3.2 \times 10^2$  cfu/g, and the highest  $5.61 \times 10^4$  and  $4.2 \times 10^4$  cfu/g, respectively. The minced chicken portion of chicken sandwich contained slightly higher count (lowest  $3.1 \times 10^2$  and highest  $6 \times 10^5$  cfu/g) as it was not fried like chicken burger and hot dog. The bread portion also contained the considerable number of viable bacterial count.

The coliform counts were unacceptable in most of the samples where, bread portion of all the samples contained almost same number of coliform count which was also unacceptable. The total coliform count (TCC) of bread portion of chicken sandwich, chicken burger and hot dog were found to be  $3.3 \times 10^3$ ,  $2.0 \times 10^3$ , and  $6.9 \times 10^2$  cfu per g, respectively. The highest count ( $7.34 \times 10^5$  cfu/g) was found in lettuce portion of chicken burger sample. There was no coliform count in minced beef portion of hotdog sample. Though the viable count of minced chicken portion of chicken burger samples were acceptable but the coliform count was unacceptable. TCC of minced chicken of chicken sandwich and chicken burger were found to be  $8.1 \times 10^3$ ,  $1.0 \times 10^2$  cfu per g, respectively. The entire sample contained unacceptable number of coliform in which the lettuce portion contains the highest count.

The search of faecal indicators especially total coliform (TC), and *E. coli* are widely employed in the testing of food quality (Anderson and Baird-Parker, 1975). Testing of *E. coli* is the basis of the presence of indicator organism. All the portions of chicken burger and hotdog contained higher number of *E. coli*, whereas chicken sandwich contained the *Klebsiella*. The results showed that almost all the samples were not only unsafe but potentially dangerous because of the presence of higher number of *E. coli* and *Klebsiella*.

The microbiological analysis of different types of meat based fast foods suggested that in most of the fast food samples, higher number of coliform bacterial count made the food unsafe and unhygienic. Though the fried portion gave the least number of bacterial counts, the raw portion (lettuce) was the most responsible one. The storage conditions of all the shops were unhygienic. In some cases fast foods were kept within glass under

lighting for long period of time. This condition is very dangerous because it can create an optimum growth temperature for food borne microorganisms and thus food could be spoiled and unsafe for consumption. During serving the handlers did not maintain proper hygienic condition, which might act as major source of microbial contamination.

The study has revealed many important issues relating to contamination of foods by pathogenic organisms. The most important factor that influences the contamination of food is “personal hygiene” (Khan and Malek, 2002). In all the cases, it was found that shoppers do not wash their hand properly more or less before serving foods (Table 2). Pathogens may exist on the finger tips that cannot be washed off simply by hand washing. These pathogens may along with other organisms be able to be transferred to the foods. It was severe in Dhaka university campus. May be for this reason the coliform count was highest in the chicken burger samples. It was found that servers of lower and middle class shops washed their hands with dirty water or towels. They do not use enough soap or detergent for washing. They use the same water for washing used utensils over and over again.

It is supported by a recent review of shigellosis in the USA which stated that the majority of the cases studied were cared by poor personal hygiene on the part of the food handlers (Smith 1987).

Most of the servers of the lower class shops were found illiterate and very much unconscious about hygiene and sanitation. But the servers of the higher class fast food shops (some shops of the Aziz Super Market) were mostly educated. They seem to know sanitary and hygienic manner. Thus there seems to have a significant relationship between educational status of servers and food safety. Government should pay attention in this matter. Action is required in the form of food inspection services supported by realistic legislation, efficient analytical laboratories and health education of food handlers (Salam 1994).

## CONCLUSION

The bacteriological condition of different meat based fast food samples and their safety assessment revealed that most of the foods were unacceptable. The lettuce portion of chicken burger exceeded the microbial quality limit whereas; the fried portion gave the least number of bacterial counts. The results of microbiological assessment and the corresponding questions that were asked to the food handlers and food servers suggested that the microbial safety of the investigated fast foods depends not only on the environmental conditions but also on the personnel hygiene. The study was confined only to certain regions around Dhaka university campus, so the results do not represent the whole city. Detailed study is required concerning more areas, increasing sampling sites and their numbers.

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