

ASSESSMENT OF MICROBIAL POPULATION IN VEGETABLES CONTAINING FAST FOOD ITEMS IN SYLHET METROPOLITAN AREA

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Abstract

A study was conducted with a view to demonstrate the bacterial loads and identification of the bacterial organisms contaminating fast food items in the retail outlets of Sylhet metropolitan area and in around Sylhet Agricultural University, Sylhet. Bacteriological investigation was conducted on 64 samples of 4 different types of fast food. The result was expressed in cfug⁻¹ of sample. Mean value of Total Viable Count (TVC) per gram of fast food items Vegetable singara, Shamucha, Potato chop and Vegetable roll were found to be 104.5×10⁹, 93.5×10⁹, 100.5×10⁹ and 67×10⁹ respectively collected from Baluchor Bazar, Uposhohor, Zindabazar and Shibgonj. The highest mean value of TVC was 104.5× 10⁹ from Vegetable singara and the lowest mean value of TVC was 67 ×10⁹ from Vegetable roll. The antibiotic sensitivity was done in this study and found that isolated *Escherichia coli* was highly sensitive to Chloramphenicol, Gentamycin and Ceftriaxone, moderately sensitive to Gentamycin and Ceftriaxone and resistant to Amoxicillin, Ceftriaxone Nalidixic Acid and Bacteria.

Keywords: TVC, TCC, Antibiotic sensitivity, Bacteria

Introduction

Food is any substance, usually composed of carbohydrates, fats, water and proteins that can be eaten or drunk by an animal or human for nutrition or pleasure. Almost all foods are of plant or animal origin, with some exceptions. There are a number of food items that support microbial growth. Several factors encourage or prevent, or limit the growth of microorganisms in foods; the most important factors are water availability, pH, and temperature (Smith and Fratamico, 1995). Fast food is the term given to food that can be prepared and served very quickly. Any meal with short preparation time can be considered as fast food. Typically the term refers to food sold in a restaurant or store with preheated or precooked ingredients, and served to the customer in a pack form for take-out/take away. In Bangladesh perspective, fast foods are Singara, Shamucha, Vegetable roll, Potato chop etc. Among these fast foods some are sold as a street food mostly Singara and Shamucha. Although the street food industry offers a significant amount of employment, often to persons with little education and training. But at the same time it has high risk of contamination by microbes at all stages of production, processing and distribution which are very difficult to control through regulations. Microorganisms in fast and traditional fast foods are responsible for many human diseases (Angelillo *et al.*, 2000). Fast food may serve as a carrier for a wide variety of microorganisms including pathogenic bacteria and fungal species. The genera included *E. coli*, *Bacillus*, *Staphylococcus*, *Aspergillus*, *Fusarium*, *Penicillium*, *Rhizopus* etc. (Beuchat, 1998), Yapp and Fairman (2006) reported that inadequate refrigeration and/or sanitation that prepared Regulatory Transport Enterprise (RTE) foods experience might create conditions under which any existing bacteria may flourish, especially if lack of proper handling practices occurs. The present study was conducted to evaluate the status of microbial load of some fast food items with quantitative analysis of pathogenic microorganism present in different brands of vegetable containing fast food, isolation and identification of bacteria special emphasis on *Escherichia coli*.

Materials and Methods

The entire work was performed in the laboratory of the Department of Microbiology and Immunology, Sylhet Agricultural University (SAU), Sylhet from January to May 2015. A total number of 64 fast food samples were examined. Fast foods samples were obtained from fast food restaurants in Sylhet metropolitan area. Samples included vegetable singara, vegetable shamucha, Potato chop and Vegetable Roll. To determine the extent of bacterial load the

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samples were subjected to Total Viable Count (TVC), Total Coli form Count (TCC) by using plate count agar. Individual colonies found in plate count agar then sub cultured in MacConkey Agar (MCA), Eosin Methylene blue (EMB) agar media and then subjected to biochemical tests (Sugar fermentation, IMViC test) and Motility test for the isolation and identification of the bacteria. Antibiotic sensitivity test also performed. Analysis was performed by Descriptive Statistics.

Results and Discussion

A total of 64 fast food sample of 4 items from 4 areas were collected (Baluchor Bazar, Uposhohor, Zindabazar and Shibgonj) and carried to the laboratory aseptically within short time. The result was expressed in cfug⁻¹ of sample. The mean value of TVC and TCC were recorded. Mean value of TVC gram⁻¹ of fast food item (vegetable singara, shamucha, potato chop chop, vegetable roll) were found 104.5×10⁹, 93.5×10⁹, 100.5×10⁹, 67×10⁹ respectively collected from Baluchor Bazar, Uposhohor, Zindabazar and Shibgonj and these are present in Table 1 and Fig. 1. The highest mean value of TVC was 104.5× 10⁹ from Vegetable singara. The lowest mean value of TVC was 67 ×10⁹ from Vegetable roll. Mean value of TCC gram⁻¹ of fast food item was 99×10³, 85×10³, 79.5×10³, and 67. 5×10³. The highest mean value of TCC was 99 ×10³ from Vegetable singara. The lowest mean value of TCC was 67. 5 ×10³ obtained from vegetable roll shown in (Table 1, Figs. 2 and 3).

Table 1. Bacterial status in different fast food item collected from four locations

Name of the items	No. of the samples examined	Mean TVC cfug ⁻¹	Mean TCC cfug ⁻¹
Vegetable singara	16	90×10 ⁹ -119×10 ⁹ (104.5×10 ⁹)	75×10 ³ -123×10 ³ (99×10 ³)
Shamucha	16	80×10 ⁹ -107×10 ⁹ (93.5×10 ⁹)	70×10 ³ -100×10 ³ (85×10 ³)
Potato chop	16	90×10 ⁹ -111×10 ⁹ (100.5×10 ⁹)	54×10 ³ -105×10 ³ (79.5×10 ³)
Vegetable roll	16	41×10 ⁹ -93×10 ⁹ (67×10 ⁹)	50×10 ³ -85×10 ³ (67.5×10 ³)
Mean		92.5	83.56
Range		78	73
Maximum		119	123
Minimum		41	50
Standard Error		4.74	5.46
Standard Deviation		18.94	21. 86

Contamination of *E. coli* fast food samples.

Most of the samples contained the *Escherichia coli*. But the percentage of the presence of *Escherichia coli* varied in different areas. The highest percentage (75%) of *Escherichia coli* was found in Baluchor bazar and the lowest percentage was found in Uposhohor and Shibgonj (25%). The highest percentage of *E. coli* present in vegetable singara (87.5%) and lowest in vegetable roll (12.5%) shown in Table 2.

Antimicrobial sensitivity test

Antimicrobial sensitivity pattern of isolated *Escherichia coli* was performed after isolation against 6 commonly used antibacterial agents of different groups. A total of 28 *Escherichia coli* isolates were tested for antimicrobial sensitivity by the Kirby-Bauer disc diffusion method according to Clinical Laboratory Standards Institute, 2006. After incubation, the plates were examined and diameters of the zone of inhibition for individual antimicrobial agents were measured by mm scale and was comparing with sensitivity of control strain. The zone diameters for individual antimicrobial agents were designed as susceptible, intermediate and resistant categories by referring to an interpretation. The result of the

antibiogram study of the fast food samples revealed that 8 samples (out of 28 samples) of *Escherichia coli* 100% resistant to Amoxicillin, Nalidixic Acid, Bacitracin and 50% resistant to Ceftriaxone. 100% susceptible to Chloramphenicol, 50% are susceptible to Gentamicin, 13% susceptible to Ceftriaxone. 50% were intermediate to Gentamicin and 13% were intermediate to Ceftriaxone shown in Tables 3 and 4.

Table 2. Percentage of *E. coli* in different samples of the four locations

Name of the Sample	No. of sample	Name of the locations				Percentage of infection
		Baluchor Bazar	Uposhohor	Zindabazar	Shibgonj	
Vegetable Singara	16	6	3	3	2	87.5
Shamucha	16	2	1	2	1	37.5
Potato chop	16	3	0	2	1	37.5
Vegetable roll	16	1	0	1	0	12.5

Table 3 . Antibacterial sensitivity patterns of the isolated *Escherichia coli* from fast food sample

<i>E. coli</i> isolates	Susceptible	Intermediate	Resistant
VS 1	C	Gen	Amx, Na, Ctr, B
VS 2	C	Gen	Amx, Na, B
SH 3	C, Ctr	Gen	Amx, Na, B
SH 4	C	Gen, Ctr	Amx, Na, B
AC 1	C, Gen	--	Amx, Na, Ctr, B
AC 2	C, Gen	--	Amx, Na, Ctr, B
VR 3	C, Gen	--	Amx, Na, Ctr, B
VR 4	C, Gen	--	Amx, Na, B

Ctr = Ceftriaxone Amx = Amoxicillin Na = Nalidixic Acid C = Chloramphenicol B = Bacitracin Gen = Gentamycin

Table 4. Diameter unit of zone of inhibition of different antimicrobial agents used for antibiogram profile study of the isolated *Escherichia coli*

<i>Escherichia coli</i> Isolates	Diameter of zone of inhibition (mm)					
	Gen 10 µg	Amx 30 µg	NA 30 µg	CTR30 µg	C 30 µg	B10 µg
VS 1	14	-	13	12	25	2
VS 2	14	-	15	14	22	4
SH 3	13	-	-	18	19	1
SH 4	14	-	-	15	18	-
AC 1	19	-	10	12	23	-
AC 2	15	-	14	11	19	4
VR 3	16	-	12	12	20	2
VR 4	24	-	19	14	24	1

Ctr = Ceftriaxone Amx = Amoxicillin Na = Nalidixic Acid C = Chloramphenicol B = Bacitracin Gen = Gentamycin

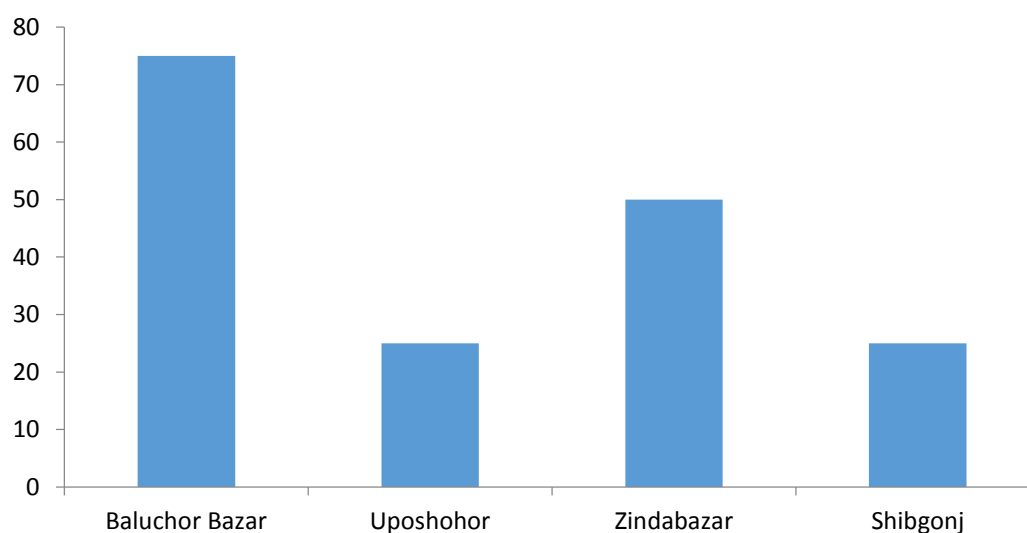


Fig. 1. Prevalence of *Escherichia coli* at different areas in Sylhet region. (Define X axis as incidence/prevalence and Y axis as locations of this Figure)

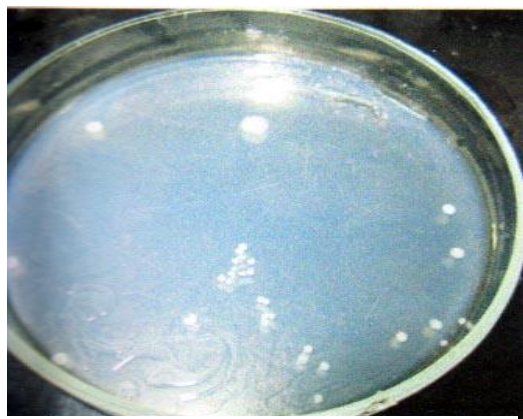


Fig. 2. Viable bacterial count agar indicating Total Viable Count (TVC)



Fig. 3. Colonies of *E. coli* on EMB agar showing metallic sheen

Conclusion

The variation in pathogens of the fast food may be due to variation in the hygienic maintenance during making and serving of food. Food workers may transmit pathogens to food from a contaminated surface, from another food, or from hands contaminated with organisms from their gastrointestinal tract. Hand contact with ready-to-eat foods represents a potentially important mechanism by which pathogens may enter the food supply. Some of fast foods are not sold the day when these are prepared. The seller stores this fast food and sells two to three days after it prepared. Consumers were not aware about the hygienic status of foods. It can be concluded that if people have meal regularly and in suitable quantities, there will not be any health problems, relating habits concerning to nutrition according to what the healthy nutritional expert specify, if all the society follow right nutritional habits, healthy foods, they have health.

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