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QUANTITATIVE ANALYSIS OF ESCHERICHIA COLI PRESENT IN STREET FOODS IN TUGUEGARAO CITY

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ABSTRACT

This study was conducted to determine the microbial load found in street foods in Tuguegarao City. Plate counts on Nutrient Agar to determine total microbial load and number of presumptive Escherichia coli colonies. Identification of Escherichia coli was done using standard microbiological techniques involving the use of selective and differential media. Gram staining was performed to confirm morphological characteristics of isolates.

Results of the study revealed that microbial load was found highest at sample 2 with a mean of $1.51x10^7$.The number of presumptive Escherichia coli was found highest at sample 3 with a mean of $4.65x10^6$.Successive confirmatory biochemical tests on presumptive Escherichia coli isolates confirmed the presence of Escherichia coli. The presence of rod-shaped and pinkish cells from Gram-stained isolates reveals the Gram-negative bacteria and further confirms the presence of Escherichia coli.

***KEYWORDS**: Escherichia coli. ,street foods, fish ball, Gram stain, microbial load*

INTRODUCTION

Food**b**orne illnesses of microbial origin are a major health problem associated with street foods (Biswas, 2010; Tabashsum, 2013; Mamun, 2013). In addition, resistance of food borne microorganisms in multi-drug made the food safety situation more vulnerable in public health (Khan, 2011).Street foods are ready-to-eat foods and beverages prepared and/or sold by vendors or hawkers especially in the streets and other similar places. They represent a significant part of urban food consumption for millions of low-and-middle-income consumers, in urban areas on a daily basis. Street foods may be the least expensive and most accessible means of obtaining a nutritionally balanced meal outside the home for many low income people, provided that the consumer is informed and able to choose the proper combination of foods. The risk of serious food poisoning outbreaks linked to street

foods remains a threat in many parts of the world. A lack of knowledge among street food vendors about the causes of food-borne disease is a major risk factor. Although many consumers attach importance to hygiene in selecting a street food vendor, consumers are often unaware of the health hazards associated with street vended foods(FAO 1988).

The conditions under which some street vendors operate are reported to be unsuitable for the preparation and selling of food (Barro, 2006; Bryan 1981). The place of preparation is not always clean, well lit and not far from source of contamination. Preparation surfaces used by some vendors have remains of foods prepared earlier that can promote cross contamination. Most of these foods are not covered and are exposed to flies and dust, which may harbor food borne pathogens. In 70–90% of the cases, presence of animals, insects and liquid wastes in food preparation areas have been reported (FAO 1988). The two major sources from where the contaminants can enter the preparation area are: Improper food handling and waste disposal.

OBJECTIVES OF THE STUDY

Generally, this study aims to determine the quantitative analysis of *Escherichia coli* in the street foods in Tuguegarao City.

Specifically, this study aims to:

1. Determine the microbial load of street foods.
2. Determine the colony forming unit (cfu/ml) of presumptive *Escherichia coli* found in street foods.

MATERIALS AND METHODS

Research Design

The researchers used Quantitative method to determine the colony count of Esherichia coli found in street foods.

Materials

The materials used in the conduct of the study were, incubator, colony counter, stirring rod, glass L-rod, petri dish, pipette, test tubes, test tube rack, aluminium foil, alcohol

lamp, match, inoculating loop, inoculating needle, cotton plugs, vortex shaker, graduated cylinder, beaker, flask, Nutrient Agar, Gentian Violet, Grams's Iodine, ethyl alcohol and saffranine.

Data Gathering Procedures

Food samples (Fish ball) were collected in the afternoon from different vendors located in Caritan, Tuguegarao City. Food samples were kept in sterilized plastic bags and sealed properly to avoid contamination.

Microbial Population Determination

The spread plate technique was used to determine microbial population. One ml of each dilution was plated in sterile Nutrient Agar in three replicates. The inoculums were spread using glass L-rod. The plates were incubated at 37°C for 24 hours in an inverted position. This position prevents condensation of moisture in the surface of the agar medium during incubation period.

Colony Count

Colony counting was done in plates with 30 to 300 colonies. The number of cells per ml (cfu/ml) was computed by multiplying the average of duplicate plate counts by the dilution factor divided by volume aliquot plated.

$$\text{Colony forming unit/ml} = \frac{\text{Average x d.f.}}{\text{Volume plated}}$$

Where:

Average = average number of colonies

d.f. = dilution factor

volume plated = volume of aliquot plated

Gram Stain

The most useful staining in bacteriology is Gram's Differential Stain. Practically all bacteria can be classed as Gram positive or Gram negative, depending on whether the original stain is fixed on the organism.

Escherichia coli colonies from the Lysine Iron Agar slants were collected and fixed in a microscope slide. The slide was flooded with Gentian Violet for three minutes and rinsed with distilled water. Afterwards, it was covered with Gram's Iodine solution for two minutes. The slide was decolorized with 95% ethyl alcohol until the color ceased to run from preparation, which took up 30 seconds. Then, it was counter stained with saffranine for 30 seconds.

RESULTS AND DISCUSSION

Table 1 shows that the highest microbial load was observed at replicate 3 of sample 4 with $1.73x10^7$. The lowest microbial load was observed at replicate 3,sample 4 with $1.04x10^7$cfu/ml. Microbial load was found highest at sample 2 with a mean of $1.51x10^7$.

Table 1. Total Microbial Load (cfu/ml) of Fish ball

Replicate	***(cfu/ml)***				
	Sample1	***Sample 2***	***Sample3***	***Sample4***	***Sample5***
1	$1.20x10^7$	$1.30x10^7$	$1.26x10^7$	$1.04x10^7$	$1.17x10^7$
2	$1.50x10^7$	$1.65x10^7$	$1.29x10^7$	$1.49x10^7$	$1.24x10^7$
3	$1.47x10^7$	$1.59x10^7$	$1.67x10^7$	$1.73x10^7$	$1.55x10^7$
Mean	A. $1.39x10^7$	B. $1.51x10^7$	C. $1.41x10^7$	D. $1.42x10^7$	E. $1.32x10^7$

Table 2 presents the growth of presumptive *Escherichia coli* at different replicates from different samples. Presumptive *Escherichia coli*was highest at replicate 3 of sample 3 with $5.23x10^6$cfu/ml. On the other hand, replicate 1 of sample 1 contained the lowest number of *Escherichia coli* with $3.73x10^6$cfu/ml. Presumptive *Escherichia coli* was highest at sample 3 with a mean of $4.65x10^6$.

Table2. Colony forming unit (cfu/ml) of presumptive *Escherichia coli*

F. **Replicate**	G. **(cfu/ml)**				
	H. **Sample1**	**Sample2**	**Sample3**	K. **Sample4**	**Sample5**
M. 1	N. $3.73x10^6$	O. $3.77x10^6$	P. $4.10x10^6$	Q. $3.97x10^6$	R. $4.53x10^6$
2	T. $4.30x10^6$	U. $4.50x10^6$	V. $4.63x10^6$	W. $4.30x10^6$	X. $3.70x10^6$
Y. 3	Z. $4.63x10^6$	AA. $4.33x10^6$	BB. $5.23x10^6$	CC. $4.03x10^6$	DD. $3.93x10^6$
EE. **Mean**	FF. $\mathbf{4.22x10^6}$	GG. $\mathbf{4.2x10^6}$	HH. $\mathbf{4.65x10^6}$	I. $\mathbf{4.1x10^6}$	J. $\mathbf{4.05x10^6}$

Morphological Characteristics and Gram Stain Reaction

Colonies of presumptive *Escherichia coli* from Lysine Iron Agar were picked and fixed in a microscope slide for Gram Staining.

Microscopic examination using the oil immersion objective revealed typical *Escherichia coli* characterized by rod-shaped morphology and pinkish to reddish cells indicating Gram negative bacteria.

CONCLUSION

The study reveals that street foods that were collected from different vendors contains numerous amount of *Escherichia coli*. People are encouraged to be conscious in eating all kinds of street foods because it may cause food poisoning if these foods are contaminated.

RECOMMENDATIONS

1. Analysis of microbial load of other street foods should also be identified.
2. Analysis of microbial load of other street foods collected at different time of the day should also be studied.

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