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DETECTION OF BACTERIAL CONTAMINATION IN A DIVERSE OF FOOD SAMPLES VIA AEROBIC BACTERIAL COUNT

By

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ABSTRACT

Atotal of 150 food samples food handlers and utensils swabs were used for Aerobic plate count. All examined samples of cooked food or ready to eat food were within the standard level according to ISO 4833/2003 except one sample which was meat (3.8 x 10^5CFU/g), About 38% of the examined raw and prepared samples were above the maximum limite as 21% from the warkers hand swabs ranged from 10^8 to10^7, 53%ranged from $10^6$to $10^{5,}$ 21% ranged from10^4 to 10^3 and 5% were $10^{2.}$.

INTRODUCTION

Food is a chemically complex matrix, and predicting whether, or how fast, microorganisms will grow in any given food is difficult. Most foods contain sufficient nutrients to support microbial growth. Several factors encourage, prevent, or limit the growth of microorganisms in foods; the most important are water availability, pH, and temperature**.(Dockins and Mefeters, 1978; Troller and Stinson, 1978; Bryan *et al.,* 1980; ICMSF (eds), 1980a, 1996; Roberts, 1982; Makukutu and Guthrie, 1986; Smith and Fratamico, 1995).** Food safety is a matter that affects anyone who eats food. Whether or not a person consciously thinks about food safety before eating a meal, a host of other people has thought about the safety of that food, from farmers to scientists to company presidents to federal government officials and sanitarians **(Roberts, 2001).** Food-borne illness is a major international problem and an important cause of reduced economic growth **(WHO, 2002)**. The contamination of the food supply with the pathogens and its persistence, growth, multiplication and/or toxin production has emerged as an important public health concern. Most of these problems could be controlled with the efforts on the part of the food handlers, whether in a processing plant, a restaurant, and others **(Mensah *et al.*, 2002).** Bacteria are considered the most common cause of food borne illness representing two thirds of food borne disease outbreaks and wide variety

of microbes with much common and less specific clinical Symptoms **(Sodha *et al*., 2009).** Over two hundred different diseases are known to be transmitted by the food **(Bryan, 1982).** Despite this, only a fraction of all food-borne infections are ever diagnosed and officially reported, or can be traced to a definite Vehicle and a specific causative agent **(Lukinmaa *et al.,* 2004).** To ensure that the food is microbiologically safe, both the manipulators **(WHO, 2002)** and the food need to be continually monitored **(Gilling *et al.*, 2001).** There are various factors contribute to the outbreaks of the food borne illness. The main ones are:

i) Inadequate food manipulation.

ii) Improper holding temperatures (failing to properly refrigerate food).

iii) Inadequate cooking,

iv) Contaminated equipment (failure to clean and disinfect kitchen or processing plant equipment).

v) Poor personal hygiene. Other factors that may contribute to the food borne illness include:

i) Preparing food a day or more before serving with improper holding and reheating,

ii) Cross contamination (from raw to cooked products).

iii) Adding contaminated ingredients to the previously cooked food. After foods are contaminated, the main factor is letting them remain at a temperature that allows the growth of the potentially hazardous microorganisms or its toxin production in the food. **(Abdel-Shakour *et al,* 2014).**

MATERIAL AND METHODS

Sampling:

Table (1, 2) showed types and numbers of samples used in this study.

Table (1): Food Samples

Type of samples	Number
Ready to eat food	**38**
Raw and prepared food	**13**

Table (2): Type and number of swabs samples

Type of sample	Number
Throat swab	**30**
Nasal swab	**30**
Hand swab	**30**
Utensils swab	**10**

Preparation of sample homogenate (ICMSF,1996).

To each 25 grams of the sample, 225 ml of sterile peptone water were added and thoroughly mixed using sterile homogenizer for 1 – 1.5 minutes, from which tenfold serial dilutions were prepared.

Surface swabs:

Swabs were sterile cotton screw capped plastic tubes ready for use. The sterile cotton swab drawn from the tubes, moistened in rinsing fluid solutions (buffered peptone water 1%), then rolled over a limited area, 10 cm^2 (2×5 cm), in one direction and perpendicular to this direction to represent all area. Finally, cotton swab was aseptically retained into the rinsing fluid screw capped tubes containing 10 ml buffered peptone water (1%).

Aerobic plat count (APC):(ICMSF 1996):

One ml from each of the previously prepared dilutions was transferred into two separate sterile Petri-dishes to which approximately 15 ml of sterile melted and tempered plate count agar (45C) were added. After thorough mixing, the inoculated plates were allowed to solidify before being incubated at 37^0C for 24 hours. The count per gram was calculated on plates containing 30-300 colonies and each count was recorded separately.

RESULTS

Table (3) showed group of raw food. Five samples were above the maximum limit this represent about 38%. (Table 4) showed group of food samples (Ready to eat foods) which were subjected to Aerobic Plate Count the safety of ready to eat food samples according to ISO 4833/2003 as the standard of aerobic plate count for RTE foods $\leq 10^4$ cfu/g, so all samples are accepted as are not exceed the standard of aerobic plate count limit, this is correlated to the implementation of good manufacturing/preparation practices during the different stages of food preparation as following: Proper cleaning and sanitation of all food contact surfaces and raw vegetables prior to preparation using chlorine tablets within the contact time according to material safety data sheet (MSDS) which leads to minimize the aerobic plate count to the acceptable limit. Cooling or chilling of all food items after preparation till to serving within the proper temperature which is far from Temperature Dangerous Zone (TDZ).

Table (3): Aerobic plate count in raw food

Type of sample	APC	Max. limit
Prepared chicken	6 x10^6 CFU/g	10^6 CFU/g
Prepared chicken	1.7 x10^7 CFU/g	10^6 CFU/g
Prepared chicken	5 x10^5 CFU/g	10^6 CFU/g
Prepared chicken	5 x10^7 CFU/g	10^6 CFU/g
Raw meat	3.7 x 10^6 CFU/g	10^6 CFU/g
Raw meat	5.8 x 10^5 CFU/g	10^6 CFU/g
Raw meat	8.5 x 10^5 CFU/g	10^6 CFU/g
Raw meat	3 x 10^4 CFU/g	10^6 CFU/g
Frozen Grean beans	-	
Frozen grean peas	10^4 CFU/g	10^5 CFU/g
Frozen grean beans	5 x 10^3 CFU/g	10^5 CFU/g
Frozen grean peas	3 x 10^5 CFU/g	10^5 CFU/g
Potato	4.3 x 10^6 CFU/g	

About 38% of the examined samples were above the maximum limite. This percent can be an example of bad preparation practices.

Table (4): Aerobic plate count in cooked food

Sample	APC	Max. limit
Chicken	3.6 x 10^3 CFU/g	10^4 CFU/g
Chilled chicken	4.8 x 10^3 CFU/g	10^4 CFU/g
Meat	-	
Rice	2 x 10^5 CFU/g	10^5 - < 10^6CFU/g But B. cereus is 10^4 CFU/g
Meat	3.8 x 10^5 CFU/g	10^4 CFU/g
Chicken	5 x 10^3 CFU/g	10^4 CFU/g
Rice	8 x 10^3 CFU/g	10^5 - < 10^6CFU/g But B. cereus is 10^4 CFU/g
Kidney beans	1.3 x 10^4 CFU/g	10^4 < 10^5CFU/g
Rice	-	
Meat	9 x 10^3 CFU/g	10^4 CFU/g
Potato	-	
Kidney beans	-	
Macaroni	-	
Grean beans	1.4 x 10^2 CFU/g	10^4 < 10^5CFU/g
Chichen	1.3 x 10^3 CFU/g	10^4 CFU/g
Rice	-	
Kidney beans	-	
Chicken	-	
Meat	-	
Rice	-	
Potato	-	
Chilled chicken	9 x 10^2 CFU/g	10^4 CFU/g
Grean beans	-	

All examined samples of cooked food or ready to eat food were within the standard level according to ISO 4833/2003 except one sample which was meat (3.8 x 10^5 CFU/g)

APC of workers' hand swabs:

A total of 21% from the warkers hand swabs ranged from 10^8 to10^7, 53%ranged from $10^6$to 10^5 ,21% ranged from10^4 to 10^3 and 5% were 10^2

Discussion and conclusion:

Different preparation practices were found that affect the aerobic plate count or proliferation of food pathogens as unhygienic handling; cross contamination; inadequate cleaning and sanitation of all contact surfaces; improper cooling, cooking and holding temperature **(Abdel-Shakour *et al,* 2014).** Increasing of aerobic plate count above the slandered levels refers to bad preparation practices which may be cross contamination from other contaminated food, bad personal hygiene or improper cleaning and sanitation.Food contamination with pathogens can occur at multiple steps along the food chain, including production, processing, distribution, retail marketing and handling or preparation. It was reported that numerous epidemiological reports have implicated foods of animal origin as the major vehicles associated with illnesses caused by food-borne pathogens **(Petersen and James, 1998).** Food handlers and sanitation practices can be considered the main cause of contaminated food. Foods are particularly susceptible to contamination if not handled, stored or cooked properly include; raw meat and poultry, raw eggs, raw shellfish, unpasteurized milk, 'ready to eat' foods, such as cooked sliced meats, soft cheeses and pre-packed sandwiches **(Bodhidatta *et al*., 2013).**

REFERENCE

Abdel-Shakour E.H.; Elouboudy S.S, Abdelaziz Z.K., Hassan M.A. and Emara M. B. (2014): The impact of food preparation practices on food borne diseases. Report and Opinion 2014;6 (6).

Bodhidatta, L.; Srijan, A.; Serichantalergs, O.; Bangtrakulnonth ,A.; Wongstitwilairung, B.; McDaniel, P. and Mason, C.J. (2013): Bacterial pathogens isolated from raw meat and poultry compared with pathogens isolated from children in the same area of rural Thailand. Southeast Asian J Trop Med Public Health. 44 (2):259 -72.

Bryan FL, Randallstandley S and Henderson WC (1980): Time, temperature conditions of gyros. J Food Prot 43: 346-353.

Bryan, F. L. (1982): Diseases transmitted by foods. In-The United States Centers for Disease Control CDC.

Dockins WD and Mefeters GA (1978): Feacal coliform elevated temperatures test a physiological base. Appl. Environ Microbiol 36: 341-348.

Gilling, S., Taylor, E. A., Kane, K., and Taylor, J. Z. (2001): Successful hazard analysis critical control point implementation in the United Kingdom understanding the barriers through the use of a behavioral adherence model. J. Food Protect, 64, 710-715.

ICMSF (1980a): The international commission on microbiological specification of foods (eds). Microbial ecology of foods. Vol. 1: Factors Affecting life and death of microorganisms. Academic Press, Inc., New York.

ICMSF(1996): International commission on microbiological specifications for foods.Microorganisms in foods. 5 microbiological specifications of food pathogens. Clays Ltd, St Ives Plc, Bungay Suffolk, UK.

Lukinmaa, S., Nakari, U., Eklund, M. and Siitonen, A. (2004): Application of molecular genetic methods in diagnostics and epidemiology of food-borne bacterial pathogens. APMIS, 12, 908-929. B

Makukutu CA and Guthrie RK (1986): Survival of Escherichia coli in food at hot holding temperature. J Food Prot 49: 497- 499.

Mensah P., Yeboah-Manu D., Owusu-Darku K. and Ablordey A. (2002): Street Food in Accra, Ghana: how safe are they Bulletin of the World Health Organization. 80, 546-556

Smith JL and Fratamico PM (1995): Factors involved in the emergence and persistence of foodborne diseases. J Food Prot 58: 696-708

Sodha, S.V.; Griffin, P.M. and Hughes, J.M. (2009): Foodborne disease. In: Mandell GL, Bennett JE, Dolin R, eds. Principles and Practice of Infectious Diseases. 7th ed.

Philadelphia, Pa: Elsevier Churchill Livingstone; chap 99.

Petersen KE and James WO (1998): Agents, Vehicles and casual inference in bacterial foodborne disease outbreaks. J Am Vet Med Assoc 212: 1874-1881

Roberts, C. A. (2001): The food safety information Hand Book, 1st Ed, Oryx press, USA.

WHO (World Health Organization.) (2002): Methods for foodborne disease surveillance in selected sites-report ofaWHOconsultation18-21March2002,Leipzig,Germany.

WHO/CDS/CRS/EPH/2002.22 (Geneva, Switzerland).

Troller JA and Stinson JU (1978): Influence of water activity on the production of extra cellular enzymes by Staphylococcus aureus. Apple Environ Microbiol 53: 521-526.

Roberts D (1982): Factors contributing to outbreaks of food poisoning in England and Wales. J Hyg 89: 491- 498.