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Bacteriological quality of beef burgers in Assiut City

(With 3 tables)

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التقييم البكتريولوجى للبيف بيرجر فى مدينة أسيوط

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تم فحص ٣٠ عينة من البيف بيرجر التى جمعت تحت الظروف الصحية المعقمة من محلات مختلفة فى مدينة أسيوط وقد تم عد الميكروبات الآتية العدد الكلى للبكتريا وبكتريا القولون والمكور العنقودى الذهبى ،وقد وجد أن العدد الكلى للبكتريا يتراوح بين ١,٢×١٠^{٢} إلى ٢,٧×١٠^{٤} والمتوسط فى الجرام الواحد من العينات هو ٢,٣×١٠^{٣}. كذلك كان عدد بكتريا القولون يتراوح بين ١×١٠ إلى ٣,١×١٠^{٣} ومتوسط العدد هو ٥,٨×١٠^{٢}. كما وجد أن عدد المكور *العنقودى الذهبى* يتراوح بين ١×١٠ إلى١٠×١٠^{٢} ومتوسط العدد هو ١,٥×١٠^{٢} على الترتيب. وقد أمكن عزل الميكروبات الآتية: عدد ٧ (٢٣,٣٣%) عترات ايشيرشيا كولاى ، ٦(٢٠%) عترات ، سيتروباكتر فروندياى ، ٧ (٢٣,٣٣%) عترات كلبسيلا نيمونى ، ١٠(٣٣,٣٣%) عترات انتيروباكتر كلواكى. وكذلك تم عزل عترتين بنسبة ٦,٦% من ميكروب السامونيلا وبالفحص السيرولوجى تبين أن العترتين هما *Salmonella typhi*, *Salmonella.newport*, وباقى العينات سلبى. وقد تمت مناقشة الأهمية الصحية ومدى خطورة هذه الميكروبات على صحة المستهلك.

SUMMARY

Thirty samples of beef burgers were aseptically collected from various markets in Assiut City. The samples were examined for aerobic plate counts, coliforms and *S.aureus* counts and for isolation of *Salmonella* and *Shigella*. The aerobic plate count ranged from 1.2×10^2 to 2.7×10^4/g with a mean value of 2.3×10^3/g. The counts of coliforms and *S.aureus* ranged from 1×10 to 3.1×10^3/g and 1×10 to 10×10^2 with a mean value of 5.8×10^2 and 1.5×10^2/g respectively. The coliforms which could be detected in the examined beef burgers were 7 (23.33%) *E.coli*, 6 (20%) *Citrobacter freundii*, 7(23.33%) *Klebsiella pneumoniae* and 10 (33.33 %) *Enterobacter cloacae*. 2 (6.6%). *Salmonella* was detected in the examined beef burgers samples, one (3.3%) *Salmonella typhi* and another (3.3%) *Salmonella newport*. The present investigation

indicated that food-borne pathogens present in beef burgers constitute a potential public health hazard.

Key Word: Meat products, beef burger

INTRODUCTION

Formulated food have been described as commercially prepared, ready-to-eat or ready-to-cook foods containing major ingredients from two or more commercially categories. The combining of these ingredients into a single product presents not only the original hazards of each ingredient, but also the possibility of magnified or additional hazard due to further handling, processing or modification of the environment (National Academy of Science, 1985).

Recently there has been a tremendous growth in the fast food services in Assiut City from these outlets has also increased dramatically. Such foods can become microbiologically contaminated from raw materials, handlers, or equipment. Other factors that influence the microbiological quality of beef burger include storage time, storage temperature and consumer handling practices. All of these factors may be encourage or retard microbiological growth (Adam *et al.*, 1960 and Bense *et al.*, 1974).

Ready prepared foods are fried and are usually held at room temperature for considerable periods of time and are later reheated without reaching the prescribed temperature. Usually, the poor quality of the raw materials or of the meat products for street vending is impaired even more because vending operations lack the necessary facilities to hold food within the recommended temperature ranges during long periods of time. As a result, the existing microorganisms reach levels high enough to produce food borne diseases. Furthermore, toxic substances originated during preparation of beef burgers such as those arising from inadequate handling of meat, are also sources of risk (Primo *et al.*, 1993).

The genus *Staphylococcus* comprises three species, *S.aureus, S.epidermidis,* and *S.saprophyticus* of which *S.aureus* is of most concern to food microbiologists. Staphylococci are important not only in *staphylococcus* food poisoning but also in many human infections. Staphylococcal intoxication outbreak occur frequently, and sometimes hundreds of persons are involved in one outbreak. This form of food borne illness due to a toxin produced by *Staph.aureus* in food, and the ingestion of this produced toxin by human beings results in what is

called staphylococcal food poisoning. Staphylococcal food poisoning is a syndrome characterized by nausea, vomiting, diarrhea, general malaise and weakness, beginning one to six hours after ingestion of a food (Refaie, 1984).

Processed food in which a large population of *staphylococci* has been destroyed by heating may nevertheless cause food poisoning owing to survival of the heat-resistant enterotoxins. (Lachica *et al.*, 1971).

Growth of *staphylococci* can occur either before or during processing of meat. Meat and its products have been implicated in several food poisoning out breaks reported by various investigators (Bryan, 1980).

This study was undertaken to assess the microbiological quality of beef burgers in Assiut City. The possible role of such food in transmission of food borne pathogens as well as the suggestive control measures to safeguard the consumer against food borne infections and intoxication.

MATERIAL and METHODS

Collection of samples:

A total of 30 beef burgers samples were collected from various markets at Assiut City. All samples were aseptically packaged and brought to the laboratory with a minimum of delay.

Preparation of samples:

Ten grams portions of each sample were added to 90 ml of sterile 0.1% peptone water in a sterile mortar. The sample was grinned for 3 minutes. Serial dilutions from 10 to 10^7 were made and then the bacteriological analysis was performed.

Bacteriological examination:

Aerobic plate count:

Standard plate count agar was used for the aerobic plate count according to American Public Health Association (A.P.H.A., 1972).

Coliforms:

0.1ml of each dilution was plated on violet red bile agar (VRB) according to Mercuri and Cox (1979). The plates were incubated at 37°C for 18-24 h. All purplish red colonies surrounded by a red zone of precipitated bile acids were counted. Biochemical tests were done on the isolated colonies according to Edward and Ewing (1972).

Enumeration of coagulase positive staphylococci:

0.1 ml from each of the previously prepared dilutions was transferred and evenly spread over a dry surface of Baird-Parker medium

plates (Thatcher and Clark, 1975). Inoculated plates were incubated at 37°C for 48 h. suspected colonies were counted (black and shiny colonies, greater than 1 mm in diameter showing clear hallow zone of opacity around or beneath the colonies).

Coagulase test was carried out according to Cruickshank, *et al.* (1975).

Isolation of *Salmonella* & *Shigella* organisms:

1 gm portion of each sample was inoculated into 20 ml selenite cystine broth and incubated at 37°C for 18 –24 h. After incubation a loopfull was streaked on SS agar (Difco). Suspected Salmonella or Shigella colonies were further identified biochemically and serologically according to Cruickshank, *et al.* (1980).

DISCUSSION

Aerobic plate count (APC):

The aerobic plate count is considered as indexes of sanitary quality, organoleptic quality, safety and utility of foods. The APC of perishable foods may reflect conditions such as the microbial content of the raw materials and ingredients, the effectiveness of the processing procedures, the sanitary condition of equipment and utensils, and the time-temperature profile of storage and distribution. However, most foods are regarded as unwholesome when they have a large population of microorganisms, even of these organisms are not known to be pathogenic and don't alter the character of the food (Thatcher and Clark, 1975; International Commission on Microbiological Specifications for Foods [ICMSF], 1978 and National Academy of Science, 1985).

The distribution of aerobic plate count of beef burgers is shown in Table (1). The APC ranged from 1.2×10^2 to 2.7×10^4/g. with a mean value of 2.3×10^3/g. The obtained results were lower than the result reported by Hassan (1986); Soliman (1988); El-Sherif *et al.* (1991); El-Shewehy (1994) and Ebraheem (2001).

The temperatures attained during cooking would be able to kill any vegetative pathogenic food-borne bacteria, but bacterial spores that survived cooking, and any bacteria that contaminated the meat as a result of carving or subsequent handling could have multiplied after cooking (Bryan, *et al.*, 1980).

Coliforms:

The presence of coliform organisms in meat or meat products may be responsible for their inferior quality resulting in economic losses

besides their presence in great number may raise the public health hazard (ICMSF, 1978 and National Academy of Science, 1985).

The number of coliforms in beef burgers ranged from 1 × 10 to 3.1×10^3/g with a mean value of 5.8×10^2/g (Table 1). The obtained results were higher than the result reported by Ebraheem (2001), but were lower than the result achieved by Soliman (1988) and El-Shewehy (1994).

Types of coliform organisms isolated from the examined beef burgers samples were *E.coli, Citrobacter freundii, Klebsiella pneumoniae* and *Enterobacter cloacae.*

Staphylococcus aureus:

Coagulase-positive *S.aureus* counts ranged from 1 × 10 to 10 × 10^2, with a mean value of 1.5×10^2/g. (Table 1). This result was higher than that obtained by Ebraheem (2001) in beef burgers.

Bryan *et al.*,(1980) recorded that the temperatures that would be lethal for vegetative pathogenic food-borne bacteria could not destroy staphyloenterotoxin.

Attachment of *Salmonella* spp. to beef muscle varies according to pH, temperature, compounds of the medium and the nature of meat (Bouttier *et al.*, 1997). *Salmonella* spp. is a human pathogen that is carried by cattle and may contaminate beef during the production process (Gallagher *et al.*,2002).

Moreover *Salmonella typhi* (3.3%) and *Salmonella newport* (3.3%) could be detected in the examined beef burgers samples respectively (Table 3). This may be attributed to the already contaminated meat, contamination from kives during carving of meat and/or post contamination (Ayaz *et al.*,1985).

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Table 1: Aerobic plate count, coliforms and *S.aureus* count in beef burgers/gm

	Minimum	**Maximum**	**Mean**
Aerobic plate count	1.2×10^2	2.7×10^4	2.3×10^3
Coliforms count	1×10	3.1×10^3	5.8×10^2
S.aureus count	1×10	10×10^2	1.5×10^2

Table 2: Types of coliform organisms detected in beef burgers.

No. of Examined Samples	Positive Samples		Types of coliforms organisms							
			E.coli		*Citrobacter freundii*		*Klebsiella pneumoniae*		*Enterobacter cloaecae*	
30	No.	%	No.	%	No.	%	No.	%	No.	%
	30	100	7	23.33	6	20	7	23.33	10	33.33

Table 3: Types of Salmonella organisms detected in beef burgers

No. of Examined Samples	Positive samples		Types of Salmonella in beef burgers			
			S.typhi		*S.newport*	
30	No.	%	No.	%	No.	%
	2	6.6	1	3.3	1	3.3