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BACTERIOLOGICAL ASSESSMENT OF SOME READY-TO-EAT FOODS

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ABSTRACT

A total of sixty random samples of grilled chicken, chicken luncheon, beef shawerma, beef burger, yoghurt and veta cheese (10 samples of each) were collected from different cafeterias in Giza Governorate and examined bacteriologically. Our study revealed presence of E. coli by ratio of 20%, 10%, 10%, 20% 10% and zero% in the examined samples of grilled chicken, chicken luncheon, beef shawerma, beef burger, yoghourt and veta cheese respectively. Whereas Salmonella spp. were not detected, but Staph aureus spp. were detected by ratio of 40%, 10%, 20%, 30%, 20% and 20%, respectively in the examined samples. While mean Yerisina were detected by ratio of 10% in each of grilled chicken, beef shawerma and beef burger samples but failed to be detected from the examined samples of chicken luncheon, yoghourt and veta cheese samples.

This study determined aerobic plate count, enterobacterial count, Bacillus cereus count and Staph aureus count in the examined samples.

INTRODUCTION

The first consumer right is to have a product of good quality and not constituting any health hazard. Poultry meat products are highly desirable, palatable, digestible and nutritious for all ages.

A large number of many kinds of micro organisms such as *E.coli*, *Salmonella*, *Staph. aureus* and *Yersina enterocolitica* gain access to food from soil, water, hands and equipment during different stages of processing. Bacterial load becomes aggravated from utensils and meat additives such as spices, coloring matter and starch. By cooking at very high temperature for short time (grilling) all the vegetative bacteria die except those which form heat resistant spores. When condition become suitable (meat and chicken sandwiches kept at room temperature for long time) the growth rate of the germinating spores would be hight. The meat sandwiches (beef burger and beef shawerma) contains mainly after grilling the aerobic spore forming bacteria and Bacillus group that increase in count by time ***(Nassif et.al., 2002).***

Certain members of aerobic spore forming organisms specially *Bacillus cereus* are reported in food poisoning outbreaks. Some spores will survive cooking and subsequently germinate into bacilli which under warm storage condition in cooked food, grow and produce toxins. The toxin responsible for the vomiting Syndrome is extremely heat resistant , it is not destroyed after one hour and half at 121˚c ***(Hobbs and Roberts 1987) .***

Ready-to-eat products in which the level of *Staph. aureus* has reached 10^6/gm may cause illness while the presence of Salmonellae is considered a potentially hazardous ***(Soriano et. al., 2002).***

Beef shawerma cooked on boilers attained temperature which were sufficient to kill vegetative bacteria on the surface of the meat and on the thin layer just bellow the surface but not in most internal region ***(Bryan, et. al. 1988).***

Yoghurt is one of the most unique, universal dairy product, highly nutrient, and easily digestible diet. Many enteropathogenic species have been found in milk, yoghurt and cheese stored under refrigerated temperatures. Post pasteurization contamination during manufacturing and handling, equipment, temperature abuse during transport and storage condition might result in high level of pathogenic organisms in cheese and yoghourt ***(Freitas et al., 1993)***.

Staphylococcus aureus count is an indicator of post processing cont-amination by the dairy industry ***(Flowers et al., 1992)***. In addition to *Staphylococcus aureus* produce toxin which causes vomiting and diarrhea. ***(Soriano et al., 2002)***.

Soft cheese and other dairy products have been caused staphylococcal food poisoning outbreak in Brazil and other countries. ***(Adesiyum et al., 1988; Bryan, et. al. 1988 and Almeida and Nader., 2000)***.

Microbiological standards for soft cheese were determined by National Health Department***(ICSMF,1997)*** establishing counts for *Staph. aureus* of 10^3 cfu/ g.

The present work aimed to examine some ready to eat foods including market chicken products (grilled and luncheon), meat products (shawerma and burger) and milk products (yoghurt and veta cheese) to evaluate their bacteriological quality and determine safety for consumer.

MATERIAL AND METHOD

Collection of samples:

A total of sixty random samples of ready to eat chicken, meat and dairy products (10 samples each of grilled chicken, chicken luncheon, beef shawerma, beef burger, yoghurt, and veta cheese) from different

Cafeterias and fast food restaurants in Giza. The samples were directly transferred to the laboratory and subjected to the bacteriological examination.

Preparation of samples:

All collected samples were prepared according to technique recommended by ***(ICMSF, 1978).***

Microbiological examination:

Prepared samples were examined for:

1- Aerobic plate count (A. P. C): the drop plated technique recommended by ***ICMSF, (1978)*** was applied using nutrient agar plates.

2- Total Enterobacteriacea count: according to ***(I.C.M.S.F,1978)*** using Brilliant green bile glucose agar.

3- *Bacillus cereus* count: as described by ***(Harrigan and Mecane, 1976)*** using Bacillus cereus selective agar.

4- *Staphylococcus aureus* count: according to ***(I.C.M.S.F, 1978)*** using Baird Parker medium**.**

5- Isolation and identification of *E. coli*: as described by ***(I.C.M.S.F, 1978)*** and the isolates were identified Serologically by using diagnostic sera.

6- Isolation and identification of *Salmonllae*: as described by ***(Harvey and Price, 1987).***

7- Isolation of coagulase positive *Staphylococcus aureus* : as described by ***(I.C.M.S.F,1978).***

8-Isolation and identification of *Yersinia entercolitica* : as described by ***(APHA, 1992).***

RESULTS

Table (1): Statistical analytical results of aerobic plate count in the examined samples.

Samples	Aerobic count (cfu/g)		
	Min.	Max.	Mean
Grilled chicken	$1x10^3$	$6.2x10^6$	$6.3x10^5$
Chicken luncheon	$<10^2$	$4x10^6$	$4.7x10^5$
Beef shawerma	$2x10^3$	$4x10^6$	$4.7x10^5$
Beef burger	$3x10^2$	$6x10^5$	$7.1x10^4$
Yoghurt	$5x10^2$	$3.6x10^4$	$1.2x10^4$
Veta cheese	$3x10^2$	$2x10^4$	$3.6x10^3$

Table (2): Statistical analytical results of Enterobactereacae count in the examined samples.

Samples	Enterobactereacae count (cfu/g)		
	Min.	Max.	Mean
Grilled chicken	$<10^2$	$8x10^5$	$1x10^5$
Chicken luncheon	$<10^3$	$1x10^3$	$7.1x10^2$
Beef shawerma	$<10^2$	$6x10^4$	$1.9x10^4$
Beef burger	$<10^2$	$4x10^3$	$1x10^3$
Yoghurt	$1x10^2$	$1x10^3$	$3.9x10^2$
Veta cheese	$1x10^2$	$2x10^3$	$5.5x10^2$

Table (3): Statistical analytical results of Bacillus cereus count in the examined samples.

Samples	Bacillus cereus count (cfu/g)		
	Min.	Max.	Mean
Grilled chicken	$<10^2$	$5.2x10^3$	$9.6x10^2$
Chicken luncheon	$<10^2$	$6x10^2$	$2.2x10^2$
Beef shawerma	$<10^2$	$4x10^3$	$8x10^2$
Beef burger	$<10^2$	$8x10^2$	$2.1x10^2$
Yoghurt	$<10^2$	$2x10^2$	$1x10^2$
Veta cheese	$<10^2$	$2x10^2$	7x10

Table (4): Statistical analytical results of Staphylococcal aureus count in the examined samples.

Samples	Staphylococcal count (cfu/g)		
	Min.	Max.	Mean
Grilled chicken	$<10^2$	$1x10^4$	$1.8x10^3$
Chicken luncheon	$<10^2$	$3x10^3$	$8.8x10^2$
Beef shawerma	$<10^2$	$6x10^3$	$1.7x10^3$
Beef burger	$<10^2$	$6x10^3$	$1x10^3$
Yoghurt	$1x10^2$	$3x10^3$	$6.3x10^2$
Veta cheese	$<10^2$	$5x10^3$	$1.7x10^3$

Table (5): Incidence of microorganisms isolated from examined ready to eat food samples.

Samples	E. coli		Salmonellae		Staph. aureus		Yerisina	
	No.	%	No.	%	No.	%	No.	%
Grilled chicken	2	20	0	0	4	40	1	10
Chicken luncheon	1	10	0	0	1	10	0	0
Beef shawerma	1	10	0	0	2	20	1	10
Beef burger	2	20	0	0	3	30	1	10
Yoghurt	1	10	0	0	2	20	0	0
Veta cheese	0	0	0	0	2	20	0	0

* E. coli strain for milk product : O_{119} : K_{69} and O_{112} : K_{66}.

** E. coli strain for meat and chicken product : O_{26} : K_{60}, O_{55} : K_{59} and O_{119} : K_{69}.

DISCUSSION

Table (1) showed that the mean value of total aerobic plate count in samples of grilled chicken, chicken luncheon, beef shawerma, beef burger, yoghurt and veta cheese were $6.3x10^5$, $4.7\ x10^5$, $4.7\ x10^5$,$7.1\ x10^4$, $1.2\ x10^4$ and $3.6\ x10^3$ cfu/g respectively.

This study demonstrates that grilled chicken and chicken luncheon have the highest contamination load according to total bacterial count, these count in grilled chicken samples were higher than those obtained by ***Ahmed (1991), Hamid et al., (2008)*** who recorded that the total bacterial count in grilled chicken was $6.23x10^4$ cfu/g, but the results were lower than those obtained by ***El-Khateib et. al., (1988)*** who recorded a total bacterial count of 10^7/g for chicken products and 10^7 cfu/g for burger. ***Al-Dughaym et. al., (2003)*** revealed that the mean total bacterial count was $3.3x10^7$ cfu/g for burger. Aerobic plate count in yoghurt also higher than the count ($9.5x10^3$ cfu/g) recorded by ***Khalaf and Shareef (1985). WHO (2000)*** stated that the total aerobic bacterial count was the most reliable method for detection of sanitary processing or proper storage of ready-to-eat products.

On the other hand, the results obtained in table (2) show that the mean value of Enerobacteruaceae count was high ($1x10^5$ and $1.9x10^4$ cfu/g) in both grilled chicken and beef shawerma and lower count ($7.1x10^2$, $1x10^3$, $3.9x10^2$ and $5.5x10^2$ cfu/g) were recorded for chicken luncheon, beef burger, yogurt and veta cheese. Enterobacteraceae are useful indicators of hygiene of post processing contamination of processed foods as those bacteria coming in cooked products from equipment or from contact with raw foods.

Also, it is clear from results that the mean values of Bacillus cereus count were $9.6x10^2$, $2.2x10^2$, $8x10^2$, $2.1x10^2$, $1x10^2$ and 7x10 cfu/g in the examined grilled chicken, chicken luncheon, beef shawerma, beef burger, yogurt and veta cheese samples, respectively (table 3).

Moreover, the mean *Staph. aureus* count recorded were $1.8x10^3$, $8.8x10^2$, $1.7x10^3$, $1x10^3$, $6.3x10^2$ and $1.7x10^3$ cfu/g in the examined grilled chicken, chicken luncheon, beef shawerma, beef burger, yogurt and veta cheese samples, respectively (table 4). These result were higher than that obtained by ***Al-Dughaym et al., (2003)*** who mentioned that *Staph. aureus* count from burger was less than 10^2 cfu/g. On the other hand,***Khalaf and Shareef,(1985)***recorded high count(10^3 g-1)in yoghurt.

Bacillus cereus and *Staph. Aureus* causes food poisoning. Staphylococcus spp are common environmental bacteria and thus could be introduced into the food after cooking through cross- contamination from utensils, the vendors' hands, dish, cloths. The presence of Bacillus spp and staphylococcus spp. indicate possible cross-contamination between food preparation surfaces and food itself***(Francina and Alexander 2001)***.

E. coli were found in 20% of grilled chicken and beef burger samples and in 10% of chicken luncheon, beef shawerma and yoghurt, while veta cheese were free from *E. coli* (table 5). It is obvious that the examined samples of beef shawerma and chicken luncheon were contaminated with lower percentages which may be attributed to thermal curing process of the product which plays a great inhibitory effect on multiplication of M.O ***(Gobran, 1985)***. The presence of *E. coli* in meat products indicate fecal pollution and reflects the unsatisfactory hygienic condition during manufacturing and handling of these products. ***Gonzales et al (2000)*** have investigated *E. coli* colonies isolated from white soft cheese in 11.3% of cheese samples while ***Hamid (2008)*** detected *E. coli* in 5.5% of grilled chicken.

E. coli other than 0_{157}:H_7 strain and *Salmonella* may have been introduced proper cooking, treatment during processing of such products which may be destroyed Salmonella probably existing in raw material ***(Bryan et al., 1968).***

Table (5) showed that Staphylococcus aureus contamination were confirmed in 40% samples of grilled chicken, 30% of beef burger, 20% each of beef shawerma, yoghurt, and veta cheese and 10% of chicken luncheon. These results were higher that than obtained by ***Hamid (2008)*** who revealed that *Staph. aureus* and *E. coli* contamination were found in 14.2% and 12.6% of examined samples respectively. ***Tessi et.al. (2002)*** reported *E. coli* contamination in 6.34% of ready-to-eat cooked food samples.

Fang et.al.(2003) in Taiwan found that 17.9%, 7.9% of prepared ready-to-eat meat had *staph. aureus*, and *E. coli* respectively. Some strain of *Staph. aureus* produce enterotoxins that cause staphyloccal food poisoning ***(Wikpida, 2008)***.

Also, the results in table (5) revealed that *Yersinia* could be isolated from 10% of the examined grilled chicken, beef shawerma and beef burger, these results nearly similar to ***Logue et al., (1996).*** But Francina and Alexander (2001) failed to detect *Yersinia* in ready-to-eat meat, also ***Araijo et al., 2002*** could not detected *Yersinia* in dairy product. *Yersinia* is a potential cause of food born disease in human infants the contamination related with inadequate cooking and cross contamination. occurrence of *Yersinia* spp. in food including raw or pasteurized milk and several byproduct such as cheese have been investigated in some countries ***(Moro and Nures, 1992).***

CONCLUSION

Results of this study showed high microbial counts in the examined ready to eat food samples which may be due to contamination during handling, inadequate sanitation, contaminated vegetables, long storage or fluctuated temperature during storage. This indicate a deficiency in management training, resulting in less food hygiene procedures and a lower standard of microbiological quality of the provided foods. The main factors for improving the quality of food are by decreasing handling contamination, good storage, proper processing, heat treatment, and proper management training for all workers and food processing steps.

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التقييم البكتريولوجى لبعض الأطعمة السابقة التجهيز

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تم تجميع ستون عينة عشوائية من المطاعم والكافيتريات المنتشرة بمحافظة الجيزة. وكانت العينات عبارة عن عشرة عينات من كل من الدجاج المشوية، لنشن الدجاج، شورما اللحوم، برجر اللحوم، الزبادي والجبن ثيتا.

تم فحص هذه العينات بكتريولوجياً . أظهرت النتائج تلوث العينات بالأيشيريشياكولاى بنسبة 20٪، 10٪،10٪، 20٪،10٪ و صفر فى العينات السابقة على التوالي.

كما اثبت الفحص عدم تواجد ميكروب السالمونيلا بالعينات بينما تواجد الميكروب العنقودى الذهبى بنسبة 40٪، 10٪، 20٪، 30٪، 20٪ و20٪ على التوالي في العينات المجمعة. فى حين أن تم اكتشاف وجود اليرسينيا بنسبة 10٪ فى الدجاج المشوي، لحوم الشاورما ولحوم البرجر فقط.

وكذلك تم قياس العدد البكتيري الهوائي وعدد الميكروبات المعوية وعدد ميكروب الباسيلس سيرس وعدد الميكروب العنقودي الذهبي فى العينات. وقد تم مناقشة الأهمية الصحية للميكروبات المعزولة.