



Microbiological quality of luncheon meat in Beheira governorate markets and restaurants

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ABSTRACT

A total of 100 random samples of luncheon meat were collected randomly from different markets and restaurants in El-Behira governorate, Egypt, for microbiological testing for quality. Each sample weighed 250 gram. The collected samples were transferred as rapidly and directly as possible to the laboratory in an insulated ice box under complete aseptic conditions for (1)- Aerobic plate count (APC), (2)- Enterobacteriaceae count (EC), (3)- Coliforms count (CC), (4)- Staphylococci count (SC) and (5) - detection of Salmonellae. The incidence of Aerobic Bacterial count (APC), Enterobacteriaceae count (EC), Coliforms count (CC) and Staphylococci count (SC) was 100%, 80%, 50% and 40% respectively. The mean value of APC, EC, CC and SC was 2.40×10^3 , 3.52×10^3 , 1.75×10^3 and 1.12×10^3 respectively. Salmonella failed detection from any sample. The public health significance of such bacteriological counts and isolated microorganisms as well as suggestive measures was discussed.

Keywords: Luncheon, Markets, Egypt, Microbiology, Quality

1. Introduction

Meat is considered as an essential food, tasty, easily digested and of high quality animal protein as well as has enough amounts of vitamins and minerals. Handling of meat and its products and improper heating may act as an important vehicle of infection and may cause human food poisoning. Yassien (1988) examined bacteriologically 20 samples of each pastirma, luncheon, minced meat and sausage. He found that the total aerobic count, Enterobacteriaceae count, coliform count, fecal coliform count and E.coli of samples of luncheon was $3.8 \times 10^4 \pm 1.4 \times 10^4$, $1.4 \times 10^3 \pm 9.7 \times 10^2$, 34.1 ± 23.9 and 2.3 ± 0.5 respectively. Rafaei and Nashed (1989) examined bacteriologically 20 luncheon samples and they reported that the mean value of total enterobacteriaceae count was 72.5×10^2 , further they isolated E.coli in rate of 66%. Salmonella failed detection. Gouda (1991) examined bacteriologically 25 samples of pastirma, luncheon, minced meat and sausage. She found that the total bacterial count, Enterobacteriaceae count, Coliform count and Staphylococcus count in luncheon were 5.5×10^8 , 4×10^4 , 1.4×10^3 and 2.3×10^4 respectively.

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Saleh (1991) examined bacteriologically 50 luncheon samples, 25 each of luncheon before and after casing and heat treatment, collected from some meat plants at Alexandria province. He found that the mean values of total bacterial count, Enterobacteriaceae and Staph.aureus count for samples of luncheon before casing was $9.1 \times 10^5 \pm 6.5 \times 10^4$, $3.3 \times 10^5 \pm 3.3 \times 10^4$ and $1.1 \times 10^5 \pm 1.4 \times 10^4$ organisms / gram respectively. While after casing and heat treatment the average counts was $4.7 \times 10^5 \pm 6.6 \times 10^4$, $5.3 \times 10^4 \pm 3.3 \times 10^4$ and $3.4 \times 10^4 \pm 1.4 \times 10^4$ organisms / gram respectively. Salmonellae could not be isolated from any examined samples.

Fathi et al. (1992) examined bacteriologically 12 luncheon samples. Coliforms were found in all samples with an average count of 7.4×10^3 / gram. While E.coli was detected in 5 (41.67%) of examined samples with an average count of 18.68% / gram.

Mousa et al. (1993) examined bacteriologically 25 luncheon meat samples collected from different supermarkets at Cairo and Giza governorates. They found that the mean values of total mesophilic count, Enterobacteriaceae count and Staphylococci count was 5.5×10^7 , 7×10^4 , 1.4×10^3 and 2.3×10^4 organisms / gram respectively, the incidence of E.coli and Enterobacter aerogenes was 52 and 14% respectively, but Salmonellae were not isolated from any examined samples. Coagulase positive Staph.aureus could be isolated from 18% of luncheon meat samples.

Amal and Seham (1998) analyzed bacteriologically 40 luncheon samples, which were collected from different localities in Assiut city they found that Salmonellae failed detection.

Fruin et al. (1998) examined bacteriologically 50 samples of luncheon meat purchased from high volume retail markets. They found that the mean value of aerobic plate count (APC) was 1.1×10^7 organisms / gram with a range from 8.0×10^6 to 7.0×10^7 organisms / gram, Salmonellae could not be isolated.

Nassar (1999) examined 50 random samples of locally manufactured and imported beef luncheon which were collected from Assiut city and he found that the mean value for Staph.aureus was $2.9 \pm 0.82 \times 10^4$ and $1.6 \pm 1.3 \times 10^3$ cfu / gram, for local and imported luncheon samples respectively. Also he mentioned that Staph.aureus was discovered from 10% of both local and imported samples.

Al-Naggar (2000) examined bacteriology 25 samples of each of fresh meat, beef burger, luncheon and basterma collected from butcher's shops and markets located at Damanhour. She found that the total aerobic bacterial count and total psychrotrophic bacterial count of luncheon samples was $6.9 \times 10^6 \pm 1.7 \times 10^6$ and $6.9 \times 10^6 \pm 1.6 \times 10^6$ organisms / gram respectively.

Amal (2004) reported that the mean values of aerobic plate count, Enterobacteriaceae count and coli form count / gram, for luncheon was 9.5×10^5 , 1.6×10^4 and 8.4×10^2 , respectively, The incidence of E.coli, Salmonellae and Staph.aureus in luncheon was 5%, 0% and 15% respectively.

Darweesh (2008) analyzed bacteriologically 20 random samples each of luncheon, basterma and sausage. He found that the mean values of total aerobic bacterial count and coliform count for luncheon samples was $9.24 \times 10^4 \pm 7.99 \times 10^3$ and $4.80 \times 10^2 \pm 1.16 \times 10^2$ respectively, Salmonella could not be isolated from any examined samples.

Ibrahim (2009) analyzed bacteriologically 35 random samples each of Luncheon, Basterma and Sausage in Alex. Governorate. he found that the mean values of total aerobic bacterial count and coliform count for Luncheon samples was $33.78 \times 10^4 \pm 1.79 \times 10^4$ and $3.7 \times 10^2 \pm 0.78 \times 10^2$ respectively. In addition, the study shows the incidence of E.coli in Luncheon was 5.71%. Also this work revealed that the percentage of Staph.aureus was 22.85%, in Luncheon, Salmonellae and E.coli O157 H7 could not be isolated from any examined samples.

El shamy, Y.M.(2015): reported that the mean values of aerobic plate count, Enterobacteriaceae count and coliform count / gram. luncheon was 6.8×10^2 , 4.65×10^2 and 3.50×10^2 respectively. and an incidence of Staphylococcus aureus was 80 % in luncheon samples

2. Material and methods

1-Collection of samples:

A total of 100 random samples Luncheon meat were collected randomly from different supermarkets and restaurants in El-Behira province ,Egypt each sample weighed 250 gram, the collected samples were transferred as rapidly and directly as possible to the laboratory in an insulated ice box under complete aseptic conditions for an evaluation of their bacteriological condition.

2-Culture media:

Agar ager , MacConkey agar, Mannitol salt agar, Baired parker agar, Salmonella-Shigella agar; Brilliant green bile2% broth, MacConkey broth, Selenite F.broth, Eosin Methylene blue agar, Sorbitol-MacConkey medium, Nutrient agar , Nutrient broth , peptone water , Standard plate count agar Tetrathionate broth VRBG agar and VRB agar.

Methods :

1-Aerobic plate count ,ICMF (1982).

2- Psychotrophic bacterial count ,ICMSF(1982).

3- Enterobacteriaceae count ,ICMSF (1982).

4- Coliforms count ,ICMSF(1978).

5- Staphylococcus aureus count , APHA (1992).

6- Detection and identification of Salmonella , APHA (1992).

3. Results:

Table (1): Statistical analytical results of 1- Aerobic plate count (APC) , 2- Enterobacteriaceae count(EC) ,3- Coliforms count (CC) and 4- Staphylococci count (SC)(cfu/g) of examined Luncheon meat samples (n=100)

Test	No. of positive samples	% of positive samples	Minimum	Maximum	Mean \pm SEM
1- APC Aerobic Plate Count	100	100 %	2×10^2	12×10^3	$2.40 \times 10^3 \pm 4.65 \times 10^2$
2- EC Enterobacteriaceae count	80	80 %	4×10^2	8×10^3	$3.52 \times 10^3 \pm 5.62 \times 10^2$
3- CC Coliforms count	50	50 %	2×10^2	7×10^3	$1.75 \times 10^3 \pm 3.53 \times 10^2$
4- SC Staphylococci count	40	40 %	1×10^2	5×10^3	$1.12 \times 10^3 \pm 2.72 \times 10^2$

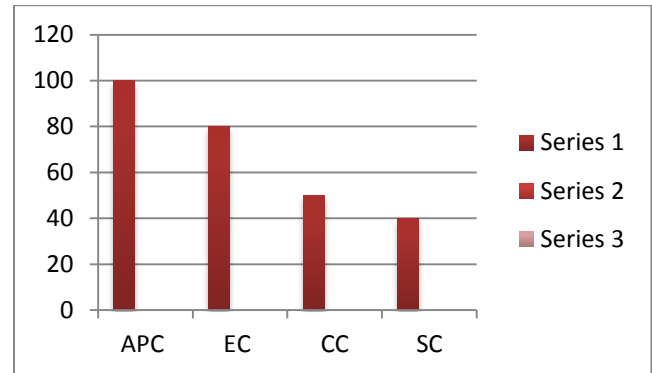
SEM = Standard error of the mean.

Means with similar letters are not significantly different at $P \leq 0.05$.

Table (2) incidence of Salmonella in examined Luncheon meat samples (n=100)

Microorganism	No. of positive samples	% of positive
Salmonella	0	0 %

Figure (1): The incidence of APC, EC, CC and SC in Luncheon meat samples:



4.Discussion

1- Total bacterial count (Aerobic plate count) (APC):

Total aerobic bacterial count is used as an important index for the level of sanitation and hygiene quality of meat products (Lillard et al., 1984). The results presented in table (1) and figure (1) showed that the incidence of APC was 100 % in all luncheon samples and APC ranged from 2×10^2 to 12×10^3 with a mean value of 2.40×10^3 . According to (EOS, 1090/2005) APC should not exceed more than 1×10^4 in luncheon. Results showed that the examined luncheon samples were within the Egyptian standards (EOS). Higher results were reported by Yassien (1988), Gab-Allah (1990), Gouda (1991), Saleh (1991), Fruin et al. (1998), Al-Naggat (2000), Amal (2004), Darweesh (2008), Ibrahim (2009). While lower results were reported by El shamy (2015).

2- Enterobacteriaceae count (EC):

Enterobacteriaceae is a group of organisms are used in food testing as hygiene indicator for fecal pollution and environmental contamination (Meat Industry Guide 2012). Enterobacteriaceae can give an advance warning of failures in hygiene procedures in food manufacturing site. The results presented in table (1) and figure (1) showed that the incidence of EC was 80 % in all luncheon samples and EC ranged from 4×10^2 to 8×10^3 with a mean value of 3.52×10^3 . Higher results were reported by Gouda (1991), Saleh (1991), Amal (2004). While lower results were reported by Yassien (1988), Rafai and Noshed (1989), Mousa et al. (1993), El shamy (2015).

4- Coliforms count (CC):

Coliforms are bacteria that are found naturally in the environment and are generally harmless. they can grow at body temperature and the presence of total Coliforms in meat products can be used as an indicative of poor handling practices. (BC Public Health Microbiology Reference Laboratory 2007). The results presented in table (1) and figure (1) showed that the incidence of Coliforms was 50 % in all luncheon samples and CC ranged from 2×10^2 to 7×10^3 with a mean value of 1.75×10^3 . According to (EOS, 1090/2005) CC should not exceed more than 1×10^2 in luncheon. we found that the examined luncheon samples were higher than the permissible limit of the Egyptian standards (EOS). Higher results were reported by Fathi et al. (1992). While lower results were reported by Yassien (1988), Gouda (1991), Amal (2004), Darweesh (2008), Ibrahim (2009) and El shamy (2015).

5- Staphylococcus aureus count (SC):

Staphylococcus aureus could cause food poisoning if it grows in large numbers can leave toxins in the product. The higher incidence of Staphylococcus aureus may due to very bad hygienic measures in many supermarkets as well as bad personal hygiene of workers (Hayes, 1992). Higher numbers of Staphylococci indicate bad personal hygiene and need good application of HACCP (Hazard Analysis Critical Control Points) system in meat products production and industries. Bailer (2005). Studies indicated that large numbers (usually greater than 1 million per gram) of coagulase positive Staphylococcus aureus must contaminate the food for

producing sufficient enterotoxin to cause food poisoning .Gilbert et al. (1972). The results presented in table (1) and figure (1) showed that the incidence of *Staphylococcus aureus* was 40 % in all luncheon samples and SC ranged from 1×10^2 to 5×10^3 with a mean value of 1.12×10^3 . Higher results were reported by Gouda (1991) , Saleh (1991), Mousa et al. (1993) , Nassar (1999) and El shamy (2015) . While lower results were reported by Hemeida et al. (1986), Amal (2004) and Ibrahim (2009) .

6-Detection and identification of *Salmonellae*:

Salmonellae is food poisoning microorganisms and According to (EOS ,1090/2005) luncheon meat should be free from salmonellae .a found that the examined luncheon samples were within the Egyptian standards (EOS).

Salmonellae could not be isolated from any examined samples.The same results were reported by Saleh (1991), Fruin et al. (1998) , Amal (2004) , Ibrahim (2009) .

5. Conclusion

The results obtained concluding that the microbiological examination was useful as it gives the first aid in judging the fitness of the product. Appropriate food handling procedures at every level of the production process can go a long way in preventing food infection. Processors must use clean sources of water to wash produce. Processing machinery must be disinfected regularly.

Conflict of interest statement

No conflicts of interest

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