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Quality assurance of some meat products

Abstract

A total number of 100 random samples of meat products represented by 25 samples of minced meat, beef burger, sausage and luncheon were collected from different supermarkets in Cairo and Giza cities. Each sample was packed in plastic bag and transferred immediately with a minimum period of delay to the laboratory in an icebox to be examined organoleptically, microbiologically and chemically. Organoleptic evaluation: Regarding the color, odor and taste, the percentages of undesirable samples of minced meat were 28%, 28% and 24%, respectively, of beef burger were 20%, 20% and 16% respectively, of luncheon were 24%, 20% and 24%, respectively and of sausage were 16%, 16% and 24%, respectively.

Microbiological evaluation: Regarding minced beef, the mean values of APC, *Enterobacteriaceae* and *Staphylococcus aureus* count were 3.3×10^5, 4.27×10^3 and 0.2×10^2, respectively and the number of samples positive to E.coli and salmonella was 4 and 3, respectively. Regarding beef burger, the mean values of APC, *Enterobacteriaceae* and *Staphylococcus aureus* count were 1.6×10^4, 7.12×10^2 and 0.1×10^2, respectively and the number of samples positive to E.coli and salmonella was 3 and 1 respectively. Regarding the luncheon, the mean values of APC, *Enterobacteriaceae* and *Staphylococcus aureus* count were 2.3×10^3, 5×10^2 and <102, respectively and the number of samples positive to E.coli and salmonella was3 and 2, respectively. Regarding sausage, the mean values of APC, *Enterobacteriaceae* and *Staphylococcus aureus* count was 4.5×10^5, 7×10^3 and 0.3×10^2, respectively and the number of samples positive to E.coli and salmonella was 5 and 6, respectively.

Chemical examination: Regarding minced beef, the results revealed that the mean values of pH, TVN and TBA were 5.89, 24.69 and 0.70, respectively and the number of accepted samples with regards to TVN and TBA was 15 and 19, respectively. Regarding beef burger, the mean values of pH, TVN and TBA were 5.8, 17.01 and 0.44, respectively. Regarding sausage, the mean values of pH, TVN and TBA were 5.9, 16.23 and 0.45, respectively and the number of accepted samples of sausage with regard to TVN and TBA were 23 and 25, respectively. Regarding luncheon, the mean values of pH, TVN and TBA were 5.9, 22.01 and 0.25, respectively.

Keywords: quality assurance, processed meat products, microbiological evaluation, organoleptic evaluation, TVN and TBA

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Introduction

Considering the consumers' demand for fresh, durable and safe foods, it is obligatory for the food industries to present their products at the best[1], because the link between nutrition and health becomes more and more a hot topic.[2] Red meat is a complete and high source of protein that is easy to digest, in addition to all essential amino acids required to the adult diet, including histidine and arginine, which are considered to be essential for children.[3] Food borne illness causes an estimated 76 cases annually resulting in billions dollars in economic and productivity losses. Food borne pathogens result in over 5000 deaths / year, one-third of which can be attributed to meat and poultry.[4]

Materials and methods

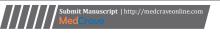### Collection of samples

Organoleptic examination

A. The samples were evaluated physically for color, odor, taste and texture according to Gracey[5]; Miller[6] and Marriot[7]

B. Flavour[8]

Chemical examination

1. Determination of Thiobarbituric acid number (TBA):[9] with additional modification of.[10]

2. Determination of total volatile nitrogen[11]

3. Determination of pH value[12]

Microbiological examination

a. Determination of Aerobic plate count at 30 °C[13]

b. Total *enterobacteriaceae* count[14]

c. Enumeration of *Staphylococcus aureus* count[11]

d. Isolation and identification of some food borne pathogens

e. Isolation and identification of E.coli[14]

f. Identification of *E. coli*[15]

g. Morphological characters

h. Biochemical reactions

i. Vogusproskauer test (V.P.)[16]

j. Serological identification of the isolated *E. coli*[17]

Isolation and identification of Salmonellae

Isolation of Salmonellae[18]

Identification of the isolated Salmonellae

i. 1 Morphological examination

ii. 2 Biochemical reactions

iii. 3 Serological identification of Salmonella[19]

Discussion

Sensory evaluation

Table 1 revealed the following

Minced beef: Regarding color, odor and taste, the percentage of undesirable samples were 28, 28 and 24 % respectively

Beef burger: Regarding color, odor and taste, the percentage of undesirable samples were 20, 20 and 16 % respectively

Luncheon: Regarding color, odor and taste, the percentage of undesirable samples were 24, 20 and 24 % respectively. Samir-Shimaa[20] obtained nearly similar results regarding the color and odor.

Sausage: Regarding color, odor and taste, the percentage of undesirable samples were 16, 16 and 24 % respectively. The obtained results were higher than those reported by Mohamed-Manal[21]

Table1 Organoleptic and sensory properties of the examined meat product samples (n=25)

Sensory	Color				Odor				Taste			
parameters	Desirable		Undesirable		Desirable		Undesirable		Desirable		Undesirable	
Samples	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**	**No**	**%**
Minced meat	18	72	7	28	18	72	7	28	19	76	6	24
Beef burger	20	80	5	20	20	80	5	20	21	84	4	16
Luncheon	19	76	6	24	20	80	5	20	19	76	6	24
Sausage	21	84	4	16	21	84	4	16	21	84	4	16

Microbiological evaluation

Contamination of meat products by bacteria can be due to the poor sanitation applied in the factories, the poor technology adopted more manual handling of the product and manual filling and absence of the tunnel freezing of the product which may reduce the propagation of bacteria during the phase of preparation. [22,23]

Minced beef: Results demonstrated in Table 2 reveal that the mean values of APC (CFU/g), *Staphylococcus aureus* count (CFU/g) and *Enterobacteriaceae* (CFU/g) of the examined samples were 3.3×10^5, 0.2×10^2 and 4.27×10^3, respectively. Nearly similar results were obtained by Hassan Hala 2.8×10^2 regarding *Staphylococcus aureus*

Beef burger: Results demonstrated in Table 2 reveal that the mean values of APC (CFU/g),*Staphylococcusaureus* count (CFU/g) and *Enterobacteriaceae* (CFU/g) of the examined samples were 1.6×10^4, $<10^2$ and 7.12×10^2, respectively. lower results (8.20×10^2) for APC were reported by El-Shamy-Samar (2015),[24] Higher results for *Staphylococcus aureus* count were recorded by El-Mossalami 9×10^2 and Nearly similar results (5.27×10^2) were reported by El-Shamy-Samar[25] regarding *Enterobacteriaceae* count.

Luncheon: Results demonstrated in Table 2 reveal that the mean values of APC (CFU/g),*Staphylococcusaureus* count (CFU/g) and *Enterobacteriaceae* (CFU/g) of the examined samples were 2.3×10^3, 0.1×10^2 and 5×10^2 respectively. Higher results were reported by Ashraf-Abeer (2016)[26] 8.9×103 regarding APC, Higher results were reported by Ashraf-Abeer (2016) 1.1×10^3 regarding *Staphylococcus aureus* countand nearly similar results were reported by El-Shamy-Samar[24] (2015) 4.65×10^2 regarding *enterobacteriaceae* count.

Sausage: Results demonstrated in table 2 reveal that the mean values of APC (CFU/g), *Staphylococcus aureus* count (CFU/g) and *Enterobacteriaceae* (CFU/g) of the examined samples were 4.5×10^5, 0.3×10^2 and 7×10^3 respectively. Nearly similar results were obtained by Abd El-Latef[27] 3.2×10^5, for APC, higher results for *Staphylococcus aureus* count were recorded by Abd El-Latef[27] 2.8×10^4 and lower results were obtained by El-Shamy-Samar[24] *Enterobacteriaceae* count.

Chemical examination

The increase in the values of TVN might be attributed to post processing circumstances particularly at the shop level, such as failure in freezing at storage during distribution and marketing (Table 3).[28] The increase in the values of TBA could be due to the use of old meat or the bad handling of the meat during processing, which enable the fat to get oxidized, or due to the poor technology available in the factories.

Minced beef: It is evident from Table 4 that the mean values of pH, TVN and TBA are 5.89, 24.69 and 0.70, respectively. El-Shabrawy-Hanaa[25] reported nearly similar results regarding pH (5.63) and lower results regarding TVN (5.23) and TBA (0.10); Kortoma[29] reported nearly similar results regarding TBA (0.67) and higher results regarding TVN (12.60).

Beef burger: It is evident from Table 4 that the mean values of pH, TVN and TBA are 5.8, 17.01 and 0.44 respectively. Nearly similar results were reported by Mohamed-Manal (2002) regarding pH (5.7), TVN (15.9) and TBA (0.64).

Sausage: It is evident from Table 4 that the mean values of pH, TVN and TBA are 5.9, 16.23 and 0.45 respectively. El-Shabrawy-Hanaa[25] reported nearly similar results regarding pH (5.62) and lower results regarding TVN (6.20) and TBA (0.12); Kortoma[29] reported nearly the same results regarding TBA (0.68) and TVN (15.90).

Luncheon: It is evident from Table 4 that the mean values of pH, TVN and TBA are 5.9, 22.01 and 0.25 respectively. Samir-Shimaa[20] reported nearly similar results in regards to pH (13.37) and TBA (0.18), while reported.[30]

Table 2 The mean values of APC (CFU/g), Staphylococcus aureus count (CFU/g) and total enterobacteriaceae count (CFU/g) in examined samples (n=25)

Samples	APC	Staphylococcus aureus count	total enterobacteriaceae count
Minced meat	3.3×10^5	0.2×10^2	4.27×10^3
Beef burger	1.6×10^4	0.1×10^2	7.12×10^2
Sausage	4.5×10^5	0.3×10^2	7×10^3
Luncheon	2.3×10^3	$< 10^2$	5×10^2

Table 3 Incidence of Enteropathogenic E.coli and salmonella in the examined samples (n=25)

Samples	Positive sample to enteropathogenic E.coli		Positive sample to salmonella	
	No	%	No	%
Minced meat	4	16	3	12
Beef burger	3	2	1	4
Sausage	5	20	6	24
Luncheon	3	12	2	8
Total	15	15	12	12

Table 4 Mean values of pH, total volatile nitrogen (TVN) and thiobarbituric acid (TBA) of the examined meat product samples (n=25)

Samples	pH	TVN	TBA
Minced meat	5.89	24.69	0.7
Beef Burger	5.8	17.01	0.44
Sausage	5.9	16.23	0.45
Luncheon	5.9	22.01	0.25

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Conflicts of interest

Author declares there is no conflict of interest.

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