

## INCIDENCE OF SALMONELLA IN RELATION TO SOME SUBSTANTIAL QUALITY PARAMETERS OF IMPORTED FROZEN MEAT

BY

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### INTRODUCTION

It has been accepted that meat is an excellent source of high quality animal protein, phospholipids, large amount of minerals and essential vitamins (ICMSF, 1978). However, meat are subjected to contamination with salmonella microorganisms from different sources during the period that elapse from the time of slaughtering till being consumed (Tolba, 1986). Such contamination renders the meat unfit for human consumption and may constitute a public health hazard (Bryan, 1972, Sayed, 1979, Zaki, 1980, Siliker, 1980, and ICMSF, 1980).

Salmonellosis is a zoonotic food born disease representing serious public health problems in developing world. Human diarrhoea in Egypt is a major medical problem, 14% of cases of infantile gastroenteritis in winter are caused by Salmonellae (Awad et al., 1971), as well as many food poisoning cases in various countries are caused by Salmonella serovars (Bryan, 1980 and Davey, 1985).

Chemical changes during freezing of meat depend on the rate of freezing, freezing temperature and freezing duration. Denaturation of protein resulted in increase of pro

tein resulted in increase of PH value as storage time increased (Lawrie, 1968). Most of meat proteins gradually deteriorated during frozen storage (Carroll et al, of (1981). Younathan and Watts (1959) added that the catalytic effect of active ferric form of myoglobin plays an important role in the oxidation of unsaturated fatty acids of phospholipids present in the muscle. They concluded that removal of blood as much as possible from carcass is of obvious importance.

*S. typhimurium* is the major salmonella isolates from cases of food poisoning in man and it is stated that 50-60% of the cases of food poisoning in man are attributed to this serovar (WHO, 1967).

The present study was planned to investigate the incidence of salmonellae in imported frozen meat. In addition, evaluation of the substantial quality of meat have been measured by determination of pH value, detection of rancidity and estimation of bleeding degree.

### MATERIAL AND METHODS

A total of one thousand random samples of imported frozen meat : 500 samples arrived to Animal Health Research Institute from

Alexandria and Port-Said customs and 500 samples collected from different meat shops in Cairo and Giza Governorate, collected in a sterile plastic bags, transferred to the laboratory directly and subjected to the required bacteriological examination as well as evaluation of its substantial quality. Handling and preparation of collected samples were carried out according to ICMSF, (1980).

Pre-enrichment for salmonellae using buffered peptone water recommended by Edel and Kampelmacher, (1973) was followed by using Rappaport's enrichment broth (Rappaport et al. (1956), Vassiliadis et al. (1976 and Vassiliadis, 1983), then plating on xylose Lysine Desoxycholate agar (XLD). Separate colonies of typical growth on WLD were picked up and maintained on slope nutrient agar for further identifications.

#### Biochemical Identification

The isolated strains were confirmed by biochemical tests as outlined by Edwards and Ewing (1972)

#### Serological identification :

All the isolates were subjected to serological identification by the slide agglutination technique using standard Salmonella polyvalent and monovalent (OH-agglutination sera) (Wellcome Foundation Limited, Bartford England DA 15 All) to

determine the antigenic formula of Salmonella strains (Kauffmann white scheme (Kauffmann, 1974).

Screening of substantial quality by determination of PH value (Dodge and Stadelman, 1960) detection of rancidity by using Kries test (Pearson, 1981) and estimation of the bleeding degree by using acid malachite green (Thornton and Gracey, 1974).

### RESULTS AND DISCUSSION

Despite many official scientific and food safety programs for the reduction of the incidence of salmonellae in meat, salmonella remain as one of the major food born hazards to human health implicated in many accidental food poisoning throughout the world have been studied (Edwards and Bruner, 1946 ; Foster, 1969 and Bryan, 1978). The number of reported food poisoning outbreaks of salmonella increases due to build-up of salmonella livestock as animals pass from farm through market and abattoir to be distributed locally, nationally or internationally to kitchens, besides the increased incidence of salmonellae in the animal reservoir and in humans especially those responsible for food handling (Savage, 1956).

The pH of meat affects the

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keeping quality of meat, colour, carcass grading, microbial spoilage, water holding capacity and binding properties of comminuted and restructured meat., (Dutson 1984, Paterson, 1984 and Soliman, 1987). On the other hand, oxidation of unsaturated fatty acids leads to the formation of many products, the interaction of these products with the constituents of the cells such as proteins and vita-

mins can lead to the destruction of their natural biological properties. Vernon et.al.,1970 ; Hargus et al.,1975 and Ramamohana,1981).

The degree of bleeding may have an influence on the keeping quality of meat, the residual blood remaining in the tissue is assumed to encourage bacterial decomposition and enzymatic breakdown of

Table(1):Incidence and rate of recovery of salmonella from imported frozen meat samples.

Source of samples	No. of Samples Examined	Sal.strains recovered on XLD after				Positive samples	
		24 hrs. at 43°C		48 hrs. at 43°C			
		No	%	No	%	No	%
Customs shops	500	-	0.0	3	0.6	3	0.6
	500	6	1.2	6	1.2	12	2.4
Total	1000	6		9		15	

Table(2):Frequency distribution and antigenic structure of salmonella serotypes recovered from the examined frozen meat samples.

Source of samples	Isolated serotype	Salmonella Antigenic structure					
		No	%	G.	O	phase 1	phase 2
Customs	S.Schleissheim	2	0.4	B	04	Hb	-
	S.Typhimurium	1	0.2	B	04	Hi	HI.2
Shops	S.Schleissheim	3	0.6	B	04	Hb	-
	S.Typhimurium	3	0.6	B	04	Hi	HI.2
	S.paratyphi B	2	0.4	B	04	Hb	HI.2
	s.abony	1	0.2	B	04	Hb	Henx
	S.brazaville	1	0.2	Cl	06,7	Hb	HI.2
	s.Kimuenza	1	0.2	B	04	Hi	Henx
	s.sofia	1	0.2	B	04	Hb	Henx

meat. (Gotze, 1968; Hess, 1968 and Al-Aboudi et al., 1987).

From the results achieved in Table (1), it can be concluded that Salmonellae were isolated from 1.5% of the examined samples, the incidence of Salmonellae in samples collected from customs and

lar to those reported by Paterson (1969) Shoup and Oblinger (1976); Turnbull and Rose, (1982) and Morshdy ad Roushdy (1983). Lower values had been reported by Surkiewicz et al. (1975); Roberts (1976) and El-Daly (1983); While higher findings were reported by El-Atal (1986)

Table(3): Statistical analysis of some substantial quality parameters of the examined imported frozen meat samples.

Source of samples	No. Of samples Examined	pH					Positive acidity			Bleeding degree					
		Min	Max	Mean	S.E	T.M.	TO	No	%	I.B.		B.L.		W.B.	
		No		%		No		%		No		%			
Customs	500	5.6	6.2	5.97	±0.23	1.288	4	0.8	4	0.8	0	0.0	496	99.2	
Shops	500	5.7	6.4	5.99	±0.26	1.293	4	0.8	4	0.8	0	0.0	496	99.2	

TO = Transforming efficiency

T.M. = Transforming mean was carried out according to Seneceur and Cochran(1967)

I.B. = Ill-bled

B.L. = Border line

W.B. = Well bled

Table(4): Results of illbled and rancid samples and its relation to their pH and Salmonella recovery.

S.N.	Customs samples				S.N.	Shops samples			
	K.Q.T.			Sal. recovery		K.Q.T.			Sal. recovery
	pH	Bl	R			pH	Bl	R	
1	5.81	I.B.	+	-	1	5.72	I.B.	+	+
2	5.74	I.B.	+	-	2	5.65	I.B.	+	-
3	5.62	I.B.	+	-	3	5.78	I.B.	+	-
4	5.67	I.B.	+	-	4	5.66	I.B.	+	-

K.Q.T. = Keeping quality test

pH. = Hydrogen ion concentration

Bl = Bleeding

R = Rancidity

I.B. = Illbled

shops were 0.6% and 2.4% respectively.

The results obtained were simi-

Tolba (1986); Al-Aboudi et al (1987) and Hassan (1990).

The present study indicated the Salmonella recovery was t

achieved when the tested meat were cultivated in enriched fluid medium (Rv) and incubated for 48 hours at 43°C as recommended by ICMSF (1980); Vassiliadis et al. (1974) and Beckers et al (1987).

It is evident from table (2) that the 3 Salmonellae isolates recovered from frozen meat samples of customs, were identified as *S. Schleissheim* (2) and *S. typhimurium* (1). The 12 salmonella isolates recovered from shops, were *S. schleissheim* (3), *S. typhimurium* (3), *S. paratyphi B* (2) and 1 of each of *S. abony*, *S. brazaville*, *S. kimuenza* and *S. sofia*.

The results of salmonella serovars recorded here are relatively in accordance with previous reports of several investigators (Floyd et al. 1953; and Hassan, 1991).

From the results achieved in Table (3), it can be concluded that the mean value of pH was higher in those samples collected from shops (6.4) than those collected from customs (6.20), while 4 samples (0.8%) from the each of customs and shops were rancid, also 4 samples (0.8%) were ill-bled. These findings are nearly extent to those recorded by El-Didamoni (1986); El-Atal (1986) and Hassan (1991) (pH 5.8, 5.9 and 5.9 respectively).

From the results obtained in Table (4) it is clear that all samples which showed to be ill-bled were

also rancid. There was a relationship between bleeding and rancidity. It can be concluded that this relationship might be due to that the amount of myoglobin of ill-bled muscle are the most catalysts for oxidation of fat during freezing of meat (Warriss, 1977).

In contrast, there is no positive correlation between the presence of Salmonellae and the degree of bleeding as the pH value. However, correlation between the efficiency of bleeding and the PH value of meat have been indicated by El-Sherif (1988).

### SUMMARY

A total of one thousand frozen meat samples, collected from customs and shops (500 samples of each) were subjected to bacteriological examination and keeping quality tests.

Out of 500 frozen meat samples collected from customs, Salmonella isolates were detected in 0.6% of the examined samples, the isolated serovars were *S. typhimurium* (0.2) and *S. schleissheim* (0.4). While the incidence of isolated salmonellae in imported frozen meat collected from shops was 2.4%. The isolated serovars were *S. paratyphi B* (0.4%), *S. typhimurium* (0.6%), *S. kimuenza* (0.2%), *S. schleissheim* (0.6%), *S. sofia* (0.2), *S. brazaville* (0.2%) and *S. abony* (0.2%).

Regarding the chemical examination for substantial quality of meat, the PH value of the examined imported frozen meat collected from customs were between 5.6 to 6.2, while the PH value of the examined

imported frozen meat collected from shops were 5.7 to 6.4.

Four samples (0.8%) from each of examined imported frozen meat samples of customs and shops were rancid.

Four samples (0.8%) from each of examined imported frozen meat samples of customs and shops were illbled.

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