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INCIDENCE AND ISOLATION OF SALMONELLAE FROM SOME MEAT PRODUCTS

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A B S T R A C T

This experiment was conducted on a total of three hundred random samples of meat products include (100 luncheon beef, 100 fresh sausage and 100 frozen minced meat samples); collected from different supermarkets at Qalyubia Governorate; transferred directly to the laboratory under strict hygienic conditions; for the detection, isolation and identification of salmonellae bacteriologically. Salmonellae were detected in 5.3 % of the examined meat product samples. The percentage of Salmonellae in luncheon meat, fresh sausage and frozen minced meat was 0 %, 10 % and 6 % respectively. The isolated salmonella serovars from fresh sausage were *S. typhi* (4 %), *S. typhimurium* (4%) and *S. enteritidis* (2%). The isolated salmonellae in frozen minced meat were *S. typhi* (2%) and *S. typhimurium* (4%). The current results indicated that the fresh sausage and frozen packed minced meat might represent a source for Salmonella as a foodborne disease for human being.

KEY WORDS: Luncheon, Minced meat, Salmonella, Sausage, Serovars.

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1. I N T R O D U C T I O N

Meat and meat by products are high in moisture, nitrogenous compounds, minerals, growth factors, fermentable carbohydrates (glycogen) and of favorable pH, therefore are considered as an ideal culture medium for growth of many organisms [18].

Meat products such as sausage, luncheon and minced meat are gaining popularity because they represent quick easily prepared meat meals and solve the problem of the shortage in fresh meat of high price which is not available for large numbers of families due to limited income.

Foodborne Salmonellosis continues to be a significant public health problem. Various meat products have been associated with outbreaks caused by Salmonella, Shigella and E. coli [8]. Some outbreaks of food poisoning were found to be due to consumption of meat contaminated with Salmonella organisms [20, 27].

Motile Salmonella is principally of concern as a cause of food born disease in human and is a major portion of human Salmonellosis [31]. However, many of Salmonella strains are so commonly isolated. Salmonellae could be divided into two main groups. The first group is of human origin, *S. typhi* and *S. paratyphi* (A, B and C). The second group is considered to be of animal origin, caused by other Salmonellae [21].

During the last two decades, Salmonella was considered the most common food borne pathogen in the world due to its increasing incidence [11] and its association with consumption of ready to

eat meat products. Worldwide, there are about 275 million humans had diarrheal diseases caused by Salmonella [6].

The need for control or minimize food poisoning outbreaks depends greatly on investigating the causative agents in food (meat products) and eliminating them to ensure its safety and to protect public health from microbial contamination [19].

Therefore, the aim of the present study was to throw the light on the incidence, isolation and identification of Salmonellae from some meat products (Luncheon, Sausage and frozen minced meat).

2. MATERIALS AND METHODS

2.1. Collection of samples

A total of three hundred random samples of luncheon, sausage and frozen minced meat (100 samples of each) were collected from different supermarkets at Qalyubia Governorate. The collected samples were transferred directly to the laboratory in an ice box under complete aseptic conditions. The samples were immediately examined bacteriologically for the detection of Salmonellae.

2.2. Isolation and identification of Salmonella:

The techniques adopted were carried out according to ICMSF [21]: These techniques were recommended by other investigators [2, 26].

2.2.1. Pre-enrichment:

Twenty five grams of each meat product sample were taken, cut into pieces, using sterile forceps and scissors and blended for two minutes in sterile blender jar containing 225 ml of buffered peptone water (BPW) (0.1%) as a pre-enrichment broth and incubated at 37 °C for 24 hrs.

2.2.2. Enrichment:

0.1 ml of pre-enrichment culture was transferred into sterile tubes containing 10 ml of Rappaport Vassiliadis broth [32], and the tubes were then incubated at 43°C for 24 hrs.

2.2.3. Selective plating on Xylose lysine desoxy cholate (XLD) agar plates.

2.3. Identification of the isolates:

2.3.1. Microscopical examination [9]:

Films from the prepared pure cultures were stained with Gram's stain and examined microscopically. Salmonellae are Gram negative short bacilli.

2.3.2. Biochemical examination:

Non-lactose fermenting isolates were biochemically identified using the criteria which are described by Edwards and Ewing (12) and Cruickshank et al. [9].

2.3.3. Serological identification:

Isolates proved biochemically to be Salmonella microorganisms were subjected to serological identification according to the Kauffman white scheme [22].

2.4. Determination of O (somatic) antigen:

Separate O anti sera were applied to determine the group of the Salmonella isolates.

2.5. Determination of H (Flagellar) antigen:

Polyvalent H anti sera for both phase 1 and phase 2 were tried in order to determine the complete antigenic formula of the isolates.

3. RESULTS AND DISCUSSION

Despite of the traditional food hygiene efforts for reduction of agents responsible for food borne illness, Salmonella remains as one of the major food borne health hazards, and meat plays an important role, as a reservoir, in disseminating Salmonellae. In the present study a total of three hundred random samples of meat products (100 samples of luncheon of beef, 100 samples of fresh sausage and 100

samples of frozen minced meat) were examined for Salmonellae. Salmonellae were detected in 5.3 % of the examined meat product samples. The percentage of Salmonellae in luncheon meat, fresh sausage and frozen minced meat was 0 %, 10 % and 6 % respectively.

The results present in table (1) and figure (1) revealed that Salmonellae failed to be detected in the examined luncheon samples.

Table 1 Incidence of Salmonellae in the examined meat product samples.

Samples	No. of samples	Positive	%
Luncheon (beef)	100	0	0
Fresh sausage	100	10	10
Frozen packed minced meat	100	6	6
Total	300	16	5.3

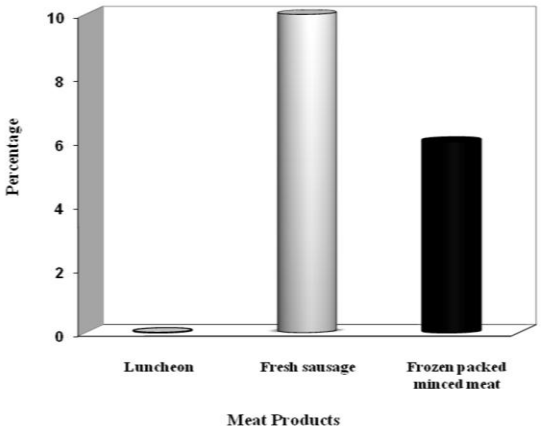

Fig 1 Incidence of Salmonellae in the examined meat product samples.

These results agree with that reported by Abdel Haffeiz and Samaha [4], Abd-El-Aziz et al. [3], Ouf [28] and Eleiwa [14]. The result disagrees with that reported by Moffatt et al. [25] who recorded that Salmonellae could be detected out of 100 examined luncheon samples. The results presented in table (1) and figure (1) revealed that Salmonellae were present in 10 % of the examined samples of fresh sausage. Nearly similar results were obtained by Cabedo et al. [7] (11.1) and Eleiwa [14] with an incidence of (8%) for each of them. While higher results were reported by Prior and Badenhorst [29] (40%), Agrimi and Barattini [5] (93.33%), Zaki, [33] (5%) and Abd El-Atty and Meshref [1] (4%) and Levine et al. [23] (1.43%).

From the results recorded in table (1) and figure (1), it's clear that 6 % of the examined samples of frozen packed minced meat were positive for Salmonellae. This result agrees with that of Abd El-Aziz [2], El-Mossalami et al. [13] while lower results were reported by Abd El-Atty and Meshref [1] (2 %). Nearly similar results were obtained by Abd El-Aziz *et. al.* [3] 5%, Darwish et al. [10] (5%).

It's evident from the results recorded in table (1) that fresh sausage had the higher incidence of Salmonella contamination followed by frozen packed minced meat. While Salmonellae could not be detected in luncheon.

The high incidence of Salmonellae in frozen packed minced meat may be due to cutting and contamination of meat besides the increase in its water and oxygen contents as well as contamination from grinders, air, packaging materials and hands of the workers. Temperature rise (2-4°C) during grinding could also increase the incidence of Salmonella organisms [16].

The absence of Salmonellae in luncheon meat may be due to the addition of food additives such as spices and preservatives, which have an antimicrobial activity and inhibit survival and multiplication of micro-organisms [24]. This also may be attributed to the exposure to high temperature during processing and cooking procedures. The high incidence of Salmonella in fresh sausage may also be attributed to the fact that this product is made from raw meat in addition to natural casing is often used in the manufacture which may be important source of

Salmonella specially if proper hygienic measures is neglected [15]. From the result recorded in table (2) and figure (2), it's clear that 5 Salmonella serovars were identified from fresh sausage samples, 2 (4%) strains as *S. typhi*, 2 (4 %) strains as *S. typhimurium* and 1 (2%) strain as *S. enteritidis.* Nearly Similar results were obtained by Rao and Nandy [30] where they could isolate *S. typhimurium* and *S. enteritidis* with a percentage of 2.5 % for each strain.

It's evident that 3 Salmonella serovars were isolated from the examined frozen packed minced meat samples and identified as 2 (4%) strains as *S. typhimurium* and one (2%) strain *S. typhi* (table 3). This result agrees with that obtained by Gobran [17] who recorded that the incidence of *S. typhi* and *S. typhimurium* in the examined minced meat samples was 4 % for each strain.

Table 2 Serotyping of Salmonellae isolated from the examined meat product samples.

Samples	No. of the examined samples	Positive samples		Salmonella serovars	Isolates		
		No.	%		No.	Incidence*	Incidence**
Luncheon	100	0	0	0	0	0	0
Fresh sausage	100	10	10	*S. typhi*	*4*	*40*	*4*
				S. typhimurium	4	40	4
				S. enteritidis	*2*	*20*	*2*
Minced meat	100	6	6	*S. typhimurum*	4	66.2	4
				S. typhi	*2*	*33.3*	*2*

*, ** indicated the incidence of salmonellae serovars isolated from the positive and total samples, respectively.

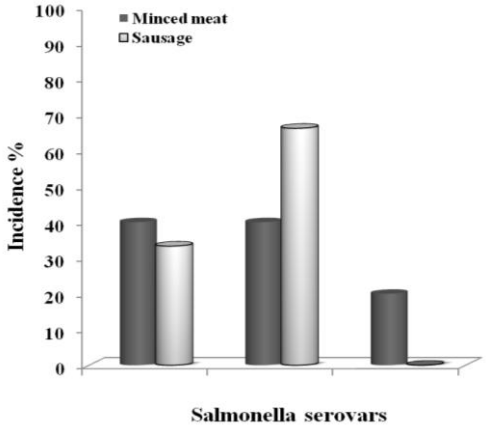

Fig. 2 Incidence of Salmonella serovars isolated from the examined meat product samples.

Table 3 Antigenic formula of Salmonellae recovered from the examined meat product samples.

Isolated Salmonellae	Antigenic formula		
	0	Phase 1	Phase 2
S. typhi	9 , 12 [vi]	d	-
S.typhimurium	1 , 4 , (5), 12	I	1 , 2
S. enteritidis	1 , 9 , 12	g , m	[1, 7]

4. REFERENCES

1. Abd El-Atty, N.S., Meshref, A.M.S. 2007. Prevalence of Salmonella and E.coli O157 in some foods. Beni-Suef Vet. Med. J., 5th Scientific Conference. pp 73-78. Abd El-Aziz, A.S. 1988. Salmonella in locally manufactured meat products. M.V. Sc., Fac. Vet. Med., Cairo University.
2. Abd El-Aziz, A.S., El-Neklawy, E.I.S., Hussien, A., Niazi, Z. 1996. Food poisoning microorganisms in some local meat products. *Vet. Med. J., Giza* **41**: 691-698.
3. Abdel Haffeiz, E.M., Samaha, I.A. 1999. Microbial evaluation of some heat treated turkey products at different processing stages. *J. Egypt. Public Health Assoc.* **74**: 1-16.
4. Agrimi, P., Barattini, G. 1976. Microbiological characteristics of 90 samples of fresh sausage and 22 samples of mortadella. *Atti. della societa italiana-della scienze Vet.* **30**: 680-682.
5. Archer, D.L., Kvenberg, J.E. 1985. Incidence and cost of foodborne diarrheal

disease in the United States. *J. Food Port.* **48**: 887-894.
6. Cabedo, L., Picart i. Barrot, L., Teixidó, i. Canelles, A. 2008. Prevalence of Listeria monocytogenes and Salmonella in ready-to-eat food in Catalonia, Spain. *J. Food Prot.* **71**:855-859.
7. CDC. 2002. U.S. Food-borne Disease outbreaks, searchable data 1990-1995. (http://www2a.cdc.gov/ncidod/food-borne/ outbreaks report. asp.)
8. Cruickshank, R., Duguid, J.P., Marmion, B.P., Swain, R.H.A. 1975. Medical Microbiology. The practice of Medical Microbiology. 12th Ed. Vol. II Churchill Livingstone, Edinburgh. London and New York.
9. Darwish, A., Hamdy, M., Nouman, T.M. 1986. Quality evaluation of market meat *Pastes. Vet. Med. J.* **34**: 37-48.
10. Desenclos, J.C., Bouvet, P., Pierre, V., Brisabois, A., Fremy, S., Lahellec, C., Grimont, F., Grimont, P.A.D. 1996. Epidemiologie des infection a Salmonella, tendances recentes en France et en Europe. *Bull. Soc. Fr. Microbiol.***11**: 209-215.
11. Edwards, P.R., Ewing, W.H. 1972. Identification of Enterobacteriaceae. Minneapolis, Burgess. Publ. Co. Atlanta, U.S.A.
12. El-Mossalami, E.E., Safwat, A.A.S., Abdel-Rahim, L., El-Sawaf, H. 1989. Salmonella in locally produced meat products. *J. Egypt. Vet. Med. Ass.* **49**: 99-108.
13. Eleiwa, N.Z. 2003. Effect of chemical preservatives on food poisoning bacteria in some locally manufactured meat products. Ph.D. Thesis, Fac. Vet. Med., Zagazig University (Benha branch).
14. Escartin, E.F., Castillo, A., Hinojosa-Puga, A., Saldaña-Lozano, J. 1999. Prevalence of Salmonella in chorizo and its survival under different storage temperatures. *Food microbiol.* **16**:479-486.
15. Field, R.A., Smith, F.C., Deane, D.D., Thomas, G.M. and kotula. A.W. 1977. Sources of Variation at the retail level in bacteriological condition of ground beef. *J. Food prot.* **40**: 385-388.
16. Gobran, R.A. 1985. Enterobacteriaceae in meat products in Upper Egypt. M.V.Sc., Fac. Vet. Med. Assuit Univ.
17. Gracey, J.F., Collins, D.S., Huey, R.J. 1999. Meat Hygiene. 10th ed., W.B. Saunders Company LTD, London, New York, Toronto, Edinburgh.
18. Hill, W.E. 1996. The polymerase chain reaction: applications for the detection of foodborne pathogens. *Crit. Rev. Food Sci. Nutr.*, **36**: 123-173.
19. Horwitz, M., Pollard, R.A., Merson, M.H., Martin, S.M. 1977. A large outbreak of foodborne Salmonellosis on Navajo Nation Indian Reservation, epidemiology and secondary transmission. *Amer. J. Public. Health* **67**: 1071-1076.
20. International commission on microbiological specification for foods (ICMSF) 1978. "Microorganisms in foods". 1- Their significance and Methods of Enumeration, 2nd Ed. Univ. of Toronto, press. Toronto.
21. Kauffmann, G. 1974. Kauffmann-White scheme. WHO-BD 172, Rev. 1. *Acta. Path. Microbiol. Sc.* **61**: 385.
22. Levine, P., Rose, B., Green, S., Ransom, G., Hill, W. 2001. Pathogen testing of ready-to-eat meat and poultry products collected at federally inspected establishments in the United States,1990 to 1999. *J. Food Prot.* **64**:1188-1193.
23. Libby, J.A. 1975. Meat Hygiene, 4th Ed. LEA and Febriger, Philadelphia.
24. Moffatt, C.R., Combs, B.G., Mwanri, L., Holland, R., Delroy, B., Cameron, S., Givney, R.C. 2006. An outbreak of Salmonella Typhimurium phage type 64 gastroenteritis linked to catered luncheons in Adelaide, South Australia, June 2005. *Commun. Dis. Intel*. **30**:443-448.
25. Mohamed, A.S. 1988. Salmonella in Locally produced meat products. M.V.Sc. Thesis, Fac. Vet. Med., Cairo University.
26. Moustafa, M.N.El-Din, Elyan, A., Gohar, M.A. 1948. Bacteriology and incidence of food poisoning in Egypt. *J. Egypt. Med. Associ.* **31**: 556-566.
27. Ouf, J.M. 2001. Microorganisms of Sanitary importance in some meat products and their additives. Ph. D. Thesis, Fac. Vet. Med., Cairo University.
28. Prior, B.A., Badenhorst, L. 1974. Incidence of Salmonellae in some meat Products. *S. Afr. Med. J.* **48**: 2532-2533.
29. Rao, N.M., Nandy, S.C. 1977. Organisms of Enterobacteriaceae family associated with animal by-Products. *Indian J. Anim. Sci.* **47**: 344-348.

30. Todd, E.C.D. 1989. Preliminary estimates of costs of foodborne disease in the United States. *J. Food Prot*. **52**: 595-601.
31. Vassiliadis, P., Trichopoulos, D., Pateraki, E., Papaiconomou, N. 1978. Isolation of Salmonella from minced meat by the use of a new procedure of enrichment. Zentralblatt für Bakteriologie, Mikrobiologie und Hygiene, 166: 81-86.
32. Zaki, E.M.S. 2003. Risk assessment of ready prepared meat products. Ph.D. Thesis, Fac. Vet. Med., Cairo University.

تواجد وعزل ميكروبات السالمونيلا في بعض منتجات اللحوم

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الملخص العربى

أجريت هذه الدراسة علي ثلاث مائة عينة من اللانشون والسجق واللحوم المفرومة والمجمدة (مائة عينة من كل نوع) من بعض السوبر ماركت المختلفة بمحافظة القليوبية وقد تم إرسال هذه العينات علي وجه السرعة وتحت ظروف صحية إلي المعمل لفحصها بكتريولوجيا والتعرف علي المعزولات . وقد أوضحت الدراسة عن النتائج التالية: لم يتم عزل ميكروب السالمونيلا من اللانشون بينما كانت نسبة ميكروب السالمونيلا في السجق الطازج (10%) وكانت العترات المعزولة هي سالمونيلا تيفي (4%) وسالمونيلا تيفيميوريم (4%) وسالمونيلا انترتيدس (2%) في حين كانت نسبة ميكروب السالمونيلا في اللحوم المفرومة المجمدة (6%) وكانت العترات المعزولة هي سالمونيلا تيفي (2%) وسالمونيلا تيفيميوريم (4%).