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## SAUSAGE AND MINCED MEAT AS A SOURCE OF FOOD POISONING MICROORGANISMS TO MAN

(With One Table)

By

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### السجق واللحوم المفرومة كمصدر لميكروبات التسمم الغذائي للإنسان

عائيل الجوهري

فى هذه الدراسة تم جمع عدد ٥٠ عينة عشوائية من السجق الطازج وكذلك عدد ٦٠ عينة من اللحوم المفرومة وذلك من مختلف المحلات والسوبر ماركت فى مدينة الأسكندرية وتم فحصها بكتريولوجيا لمعرفة مدى وجود مسببات التسمم الغذائى البكتيرية ذات الأهمية المشتركة. هذا وقد أسفرت نتائج الفحص البكتريولوجى عن عزل عدد كبير من البكتريا المسببة للتسمم الغذائى من السجق واللحوم المفرومة وهى على الترتيب كالاتى :-

Staph. aureus	٣-١ % ٣٨، % ٤٨
Strept. faecalis	٢-٥ %
Strept. faecium	٣-٣ %
E. Coli	٤-٧٥ %، ٧٨ %
Shigella flexneri	٥-٣٨، % ٥٨، % ٦٠
Proteus vulgaris	٦-٤٨ %
Proteus Morganii	٧-٥ %
Providencia spp	٨-٤٠ %

هذا وقد نوقشت أهمية هذه الميكروبات المعزولة بالنسبة لصحة المستهلك وما قد تسبب له من أضرار وكذلك الطرق المقترحة لتجنب مخاطرها .

## SUMMARY

A total of 50 random fresh sausage samples and 60 minced meat samples were collected from different shops and supermarkets in Alexandria city and examined bacteriologically for the presence of food poisoning microorganisms. The isolated bacteria from sausage were: *Staph aureus* (48.0%), *Strept faecalis* (50.0%), *E.Coli* (78.0%), *Shigella flexneri* (60.0%), *Proteus vulgaris* (48.0%) and *Providencia spp.* (40.0%). The isolated bacteria from minced meat were: *Staph. aureus* (38.3%), *Strept.faecium* (30.0%), *E. Coli* (75.0%), *Shigella flexneri* (58.3%), *Proteus morqanii* (50.0%) and *Providencia spp.* (40.0%). The zoonotic importance of each isolates as well as the suggestive methods for minimizing and preventing bacterial contamination especially those cause food poisoning were discussed.

## INTRODUCTION

Food produced from animal origin needs a special care because of its great role it played in the transmission of food borne zoonotic diseases. Sausage is considered to be one of the serious sources of human food poisoning organisms, as it is liable to be contaminated during its preparation, handling and storage. Moreover, Minced meat is one of the most susceptible meat products for microbial contamination and spoilage. Surface contamination of carcasses, time, sanitary hygienic standards of meat handling and storage conditions of the finished products, all influence the microbial of final retail product.

Some streptococci being found in food may produce toxin constituting a public health hazard (FRAZIER, 1967). The foods most often associated with staphylococcal food poisoning are those high in protein content such as meat and meat-products (NISKANEN, 1977).

Because sausage is prepared from raw meats, the initial levels of contamination may be unacceptably high. Therefore this work was planned out to throw some light on the role of sausage and minced meat in transmitting some bacterial zoonotic pathogenes and suggestive methods for minimizing and preventing the bacterial contamination especially those causing food poisoning to man.



## MATERIAL and METHODS

### Collection of samples:

A total of 50 random samples of local manufactured fresh sausage and 60 samples from minced meat, each weighting about 250 gm. were collected from different shops and supermarkets located in different areas in Alexandria city. All samples were transferred directly and rapidly as possible to the laboratory in an ice-box with a minimum of delay for bacteriological examination.

### Preparation of samples:

Each sample was aseptically and carefully free from its casing, then adequately ground and mixed thoroughly in a sterile homogenizer as quickly as possible to avoid environmental contamination. 5 grams from contents were weighted and transferred under aseptic condition in a sterile homogenizer flask containing 45 ml of sterile peptone water (0.1%). The contents were homogenized for 2.5 minutes. Then the mixture was allowed to stand for 15 minutes at room temperature (20 °C) and become readily to be culture (SALEM, 1989).

### Isolation and identification of food poisoning microorganisms:

Isolation and identification of the isolates were fulfilled according to EDWARD and EWING (1972) as well as the biochemical activities were recommended by CRUICKSHANK, et al. (1975); BAILY and SCOTT (1978) and THATCHER and CLARK (1978).

## RESULTS

Results are presented in Table (1).

## DISCUSSION

Bacteriological examination of sausage revealed that the isolation of *Staphylococcus aureus* was detected at an incidence of (48.0%) in the examined sausage samples (Table 1). This results is more higher than that obtained by HOLZAPFEL and HALL (1976); NISKANEN (1977); ABDEL AZIZ (1979); RAGEH (1980) AND TOLBA (1986). However, it was lower than those obtained by El-Nawawi and Nouman (1981) and AL-CHERIF (1983). Isolation of *Staph. aureus* at an incidence of 48.0% agree with the findings of some other workers (Malesewski et al., 1969 ; NOUMON; et al 1981 and MORSHDY, 1985). The presence of *Stap. aureus* in sausage may be originated from staphylococcal infection in meat W.H.O. (1957) or through contamination from food handlers As organism



has been implicated in food poisoning outbreak. Also presence of *Staph. aureus* in a food indicates its contamination from the skin, mouth or nose of food handlers. Some strains of staphylococci can give rise to enterotoxins which do not alter the appearance of food. Hence, such contaminated sausage may at times constitutes a public health hazard.

From minced meat as illustrated in Table (1), *Staph aureus* was isolated at an incidence of 38.3% which is higher than the results of Deso and Engeli (1979). It is one of the specific microorganisms responsible for food poisoning among human-beings (Reisler and Weiss, 1969 and Jay, 1970), which is characterized by vomiting and diarrhoea due to the production of a powerful enterotoxins (Topley and Wilson, 1975).

*Streptococcus faecalis* and *faecium* were isolated from sausage and minced meat with an incidence of 50.0% and 30.0% respectively. The presence of Enterococci in food is considered to have the same significance as coliforms where their presence is used as an index of faecal pollution (FREEMAN, 1960 and HARTMAN, et al., 1965). Therefore, determination of such organisms proved to be useful in the analysis of food. However, these types of organisms have been implicated as an etiological agents in food-borne illness (LONGREE, 1972 and LIBBY, 1978).

The presence of Enterococci in fresh sausage is an indicative of faulty production and handling. Moreover, these organisms may at times be accompanied by enteropathogenes (MORSHDY, 1985).

From the obtained results in Table (1) it can be observed that the incidence of *E. coli* in the examined sausage and minced meat samples were 78.0% and 75.0% respectively. This results were found to be lower than those reported by EL-KHATEIB (1982) and AL-CHERIF (1983). However, it higher than that obtained by ROUSHDY (1971) and EL-FEKY (1982).

From the zoonotic point of view, the consumption of sausage or minced meat contaminated with *E. coli* can led to food poisoning in the form of vomition, diarrhoea and severe enteritis in man (HUTCHINISON, 1957 and BETTY and RICHARD, 1978).

The figures presented in Table (1) it revealed that *Shigella Flexneri* was isolated from sausage and minced meat at a rate of 60.0% and 58.3% respectively. It was found to be responsible for cases of food poisoning and dysentery in man and also excreted in the faeces of man. Consequently, the detection of *Shigella Flexneri* in meat products indicated faecal pollution (Szturm-Rubinson and piechans, 1965 and Topley and Wilson 1975).



In the view of data, it would seem appropriately that *Proteus Vulgaris* and *morganii* were isolated from sausage and minced meat at an incidence of 48.0% and 50.0% respectively, which is lower than the results obtained by ROUSHDY (1971). *Proteus* organisms have been isolated from cases of cystitis and pyelitis in man (SOLTYS, 1963) and this considered as a potential pathogenes in cases of food poisoning and gastroenteritis in human-beings (JENNINGS, 1975). *Proteus* can cause deterioration of the keeping quality of meat (BURROWS, 1968). Therefore, the importance of *proteus* in food includes a potential health hazard and spoilage as well as enteric infections among human-beings (BANWART, 1979).

*Providencia* species was isolated from sausage and minced meat at an incidence of 40.0% for each one Table (1). This group of organisms have been associated with cases of enteritis and urinary tract infections in man (BAILEY and SCOTT, 1974 and CRUICKSHANK, *et al.*, 1975).

However, proper control of the product and maximum safety of the consumer could be achieved if the following recommendations were adopted: Strict hygienic measures during processing and storage of sausage, employees should have a medical certificates with self hygiene, sterilization of spices before use, as they may constitute a dangerous source of contamination and health education of food handlers on the proper hygienic practice.

#### REFERENCES

- Abdel-Aziz, A.A. (1979): Studies on hygienic quality of locally manufactured fresh sausage. M.V.Sc. Thesis High Institute Public Health Alexandria University.
- Al-Cherif, A.M.A. (1983): Sanitary status of meat factory. M.V.Sc. Thesis Cairo University.
- Bailey, W.R. and Scott, E.G. (1974): Diagnostic Microbiology A textbook for the isolation and identification of pathogenic microorganisms. 4 th Ed. The C.V. Mosby Company, Saint Louis.
- Bailey, W.R. and Scott, E.G. (1978): Diagnostic Microbiology A textbook for isolation and identification of pathogenic microorganisms. 5 th Ed. The C.V. Mosby Company, Saint Louis.
- Barwart, G.J. (1979): Basic Food Microbiology. Avi publishing company, Inc. Westport, Connecticut.
- Betty, C.H. and Richard, J.G. (1978): Food Hygiene. 4 th Ed. Edward Arnold Publishers LTD.



- Burrows, M. (1968): Textbook of Microbiology. 19 th Ed. Toppan Company Limited, Tokyo, Japan.
- Cruickshank, R.; Duguid, J.P.; Marmion, B.P. and Swain, R.H.A. (1975): Medical Microbiology. 12 th Ed. E. and S. Livingstone Limited Edinburg and London.
- Deso, L. and Engeli, P. (1979): Bacteriological control of minced meat in Zurich. Schweizer Archiv Fur Tierheilkunde, Vol. 121, No. 2, 83-93.
- Edward, P.R. and Ewing, W.H. (1972): Identification of Enterobacteriaceae. 3 rd Ed. Burgess Publishing Co., Minneapolis Minnesota.
- El-Fekey, M.I. (1982): Studies on the sanitary conditions of minced meat in Zagazig city. M.V.Sc. Thesis, Fac. of Vet. Med., Zagazig University.
- El-Khateb, T.S. (1982): Sanitary condition of sausage in Assiut. Thesis, M.V.Sc. Fac. of Vet. Med., Assiut University.
- El-Nawawi, F.A. and Nouman, T.M. (1981): Investigation into the microbiological quality of fresh raw sausage. Fleish Wirtshaft, 61, 6.
- Frazier, W.C. (1967): Food Microbiology. 2 nd Ed. McGraw-Hill, Publishing Company, LTD. New Delhi.
- Freeman, W.H. (1960): The science of meat and meat products. American Meat Institute Foundation, Reinhold Publishing Corporation, New York.
- Hartman, P.A.; Peinbold, G.W. and Saraswat, D.C. (1965): Indicator Organisms. A review roke of Enterococci in food poisoning. J. Milk Food Technol. 28: 344-347.
- Holzappel, W.H. and Hall, A.N. (1976): The microbiology of dried sausage in South Africa. J. Ani. Sci., 6: 199-206.
- Hutchinson, G.E. (1957): A treatise on limnology. Vol. 1. John Wiley and Sons. Inc. New York pp. 1015.
- Jay, J.M. (1970): Modern Food Microbiology on Meat Hygiene by Tibby, J.A. 4 th Ed. Lea and Febiger. Philadelphia, Ch. II.
- Jennings, W.S. (1975): Food borne illness in meat hygiene by Libby, J.A. 4 th Ed. Lea and Febiger, Philadelphia, Ch., II.
- Libby, J.A. (1978): Meat Hygiene 4 th Ed. Lea and Febiger, Philadelphia, Ch. II.
- Longree, K. (1972): Quantity food sanitation. 2 nd Ed. John Lville and some Inc.



- Malesewski, J.; Barlik, I.; Czarnowska, W.; Grubner, M.; Lichocinska, H.; Lukawska, Z.; Smykall, B.; Rokoszevska, J. and Osinska, M. (1969): Bacteriological evaluation of smoked raw sausage. *Roczniki Panstwowego Zakladu Higieny*. 20: 291-295.
- Morshdy, A. (1985): Sausage as a cause of gastro-intestinal disturbances. *Zagazig Vet. J. Vol. XI*.
- Niskanen, A. (1977): Staphylococcal enterotoxins and food poisoning. Technical Research Center of Finland Materials and Processing Technology No. 19 Cited after El-Nawawi and Nouman (1981).
- Nouman, T.; El-Nawawy, F.A.; Al-Ashmawy, A.M. and Sorovar, A. (1981): The microbial association in cool stored fresh sausage. *Assiut Vet. Med. J. No. 367*.
- Rageh, E.A.A. (1980): Staphylococci among some meat products. M.V.Sc. Thesis Fac. Vet. Med. Cairo University.
- Reisler, R.F. and Weiss, K.F. (1969): Production of Staphylococcus enterotoxin A,B and C in various media. *J. Appl. Microbiol.*, 18: 1041.
- Roushdy, S.A. (1971): Studies on marked minced meat. M.V.Sc. Thesis, Cairo University.
- Salem, M. (1989): Microflora of Pasterma. M.V.Sc. Thesis, Fac. Vet. Med. Alex. University.
- Soltys, M.A. (1963): 5 bacteria and fungi pathogenic to man and animals Bailliere, Tindall and Coxlondon, 1st Edition.
- Szturm-Rubinson, S. and Piechans, d. (1965); Shigella isolated from the faeces of animals. *Annls. Inst. Pasteur Paris*, 108-257.
- Thatcher, F.S. and Clark, D.S. (1978): ICMSF, microorganisms in foods 1. Academic Press., New York.
- Tolba, K.S.A. (1986): Antibiotic resistance microorganisms in some meat products. M.V.Sc. Thesis, Cairo University.
- Topley, W.C. and Wilson, G.S. (1975): Principles of Bacteriology, Virology and Immunity. 6 th Ed. Vol. II, Baltimore, The Williams and Wilkins.
- W.H.O., (1957): Meat Hygiene Monograph Series No. 33.

Table ( 1 ) : Frequency of bacteria isolated from fresh sausage and minced meat .

Isolates	Fresh sausage			Minced meat		
	No.	+ve	%	No.	+ve	%
Staph. aureus	50	24	48.0	60	23	38.3
Strept. faecalis	50	25	50.0	-	-	-
Strept. faecium	-	-	-	60	18	30.0
E. coli	50	39	78.0	60	45	75.0
Shigella flexneri	50	30	60.0	60	35	58.3
Proteus vulgaris	50	24	48.0	-	-	-
Proteus morganii	-	-	-	60	30	50.0
Providencia spp.	50	20	40.0	60	24	40.0