SHORT COMMUNICATION

INVESTIGATION OF SALMONELLA IN PRODUCTS OF MEAT ORIGIN

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ABSTRACT: *A survey was carried out to detect* Salmonella *in raw, cooked and salted samples from 99 sausages processing plant. Out of 836 samples, 39 (4.66%)* Salmonella *strains belonging to ten serotypes were isolated and* S.anatum *accounted for the highest percentage. Out of 324 raw sample products, 33 (9.24%) were most often Salmonella contaminated. It is concluded that the potential for bacterial pathogen contamination of the meat ingredients during manufacture and processing has important epidemiologic implications.*

Key Words: Salmonella, meat products.

INVESTIGACIÓN DE SALMONELLA EN PRODUCTOS DE ORIGEN CÁRNICO

RESUMEN: *Se llevó a cabo un estudio para descubrir Salmonella en muestras crudas, cocidas y salazones de 99 plantas procesadoras de embutidos. Sobre un total de 836 muestras, 39 (4,66%) se aislaron cepas de Salmonella pertenecietes a diez serotipos y S.anatum lo fue en el porcentaje más alto. De 324 productos las muestras crudas, 33 (9.24%) fueron las más contaminadas con Salmonella. Se concluye que el potencial para la contaminación de la bacteriana patógena de los ingredientes de carne durante la fabricación y procesando tiene implicaciones epidemiológicas importantes.*

Palabras clave: Salmonella, productos de carne.

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INTRODUCTION

Diseases of nutritional origin are widespread problems of the contemporary world. They are produced by toxins or infections that are acquired through the ingestion of water or contaminated food. Salmonellosis is a disease produced by microorganisms of the genus *Salmonella*, which includes two groups of infections: typhoid fever and non typhoid infections. Non-typhoid *Salmonella* spp. continue to figure prominently in many United States epidemiological registries as the leading cause of bacterial foodborne disease (D'Aoust, 1994). It can be estimated that each year *Salmonella* causes more than 12,000 acute cases of enteritis per million world wide. Data registered in different countries show that the incidence of some of the foodborne diseases has increased dramatically in recent years (Notermans et al, 1992). Salmonellosis has increased in patients immunosuppressed by AIDS, stimulating a new interest in the disease (Boruvet et al, 1992). Statistics from developed countries that maintain effective epidemiological surveillance systems suggest strongly that in some respects the battle against foodborne disease is being lost (Eyles 1995). History shows that the incidence of foodborne illnesses can be reduced, once effective control measures have been identified and industry and consumers understand them (Eyles 1995).

In order to gain a greater understanding of this disease in our country, a survey to investigate the presence of *Salmonella* in samples of meat products has been conducted over the last seven years.

MATERIAL AND METHODS

Eight hundred and thirty-six samples of different meat products (pork and beef) were taken from 99 sausage processing plants in the Buenos Aires Province. They were maintained at 4ºC and submitted for *Salmonella* culturing at the Laboratory of the Dirección de Ganadería within 18 hours. Samples were categorized according to the ingredients and the process applied (raw, cooked and salted). All the samples were analyzed as terminated products, and so was not studied the origin of the food separately. It could not be differentiated the foods of pork or beef origin. It was analyzed if the samples were originating from factories with complete treatment, or if the food was crude, cooked or saline.

For the pre-enrichment, 25 grams of each sample was added to 225 ml of buffered peptone bottle and incubated for 18 hours at 35ºC (CEPANZO, 1987, D'Aoust J.Y., 1995). Replicate portions (0.1 ml) from each pre-enrichment culture were transferred to 10 ml of *Salmonella* enrichment broth according to Rappaport-Vassiliadis enrichment medium (AOAC, 1992), incubated for 24 hours at 42.5±0.5ºC. The isolation in selective media was accomplished on *Salmonella-Shigella* (S.S.) agar and Brilliant Green Agar, Phenol-Red Lactose Agar/modified saccharose (BPLS) (Britania Lab. Argentina). After selecting typical colonies by morphology and color Gram stain from each plating medium, different physiological tests were screened biochemically on triple sugar iron (TSI), lysine iron (LI) agar and in urea broth (Britania Lab. Argentina) for production of H_2S, glucose and saccharose fermentation; urease, motility, gas production, indol and lactose; decarboxylation of lisina; methyl-red and acetoin (MRVP); phenylalanine deaminase and indol (Lara et al. 1986). Those strains identified biochemically to the genus *Salmonella* were further screened serologically using polyvalent *Salmonella* sera somatic (O) agglutination reactions (National Institute of Microbiology, Argentina). All reactive strains were sent to the National Institute of Microbiology «Carlos G. Malbrán» for definitive serotyping. The data on *Salmonella* recovering relating to each group were statistically analyzed by the X^2 test for significance findings.

RESULTS

Out of 836 samples, 39 (4.66%) were positive for *Salmonella*. The higher rate of detection (33 of 324: 9.24%) was obtained from the raw samples, this is shown by the 84.6% of the total positives or success rate (n= 33/39). The number of *Salmonella* isolations and the serotypes identified and theirs distribution of different categories of meat products were illustrated in Table 1.

Significant differences ($p < 0.05$) in *Salmonella* recovery between the groups were observed. Ten different serological types were isolated; *S.anatum* was the most frequently isolated strain (Table 2).

In Table 2 we show the isolation rates to the type of meat used by plants, 23% of isolation coincided with those that used trimmings, 20% of isolation with those that employed on clipping's carcasses; while the rest of meat combinations used cooked oscillated between 8 and 15% of isolation positive.

No *Salmonella* were detected in samples from carcasses, subsequent quarters or in self supply plants.

DISCUSSION

Foodborne diseases, i.e., illnesses due to contaminated food, are one of the most widespread problems of the contemporary world. Typhoid fever is a major health problem in developing countries and samples of meat products are one of the most important source of infections in our country. Meat and meat products have been implicated in the transmission of the human pathogens such as *Salmonella* spp. (Saide-Albornoz et al, 1995). These bacteria enter the slaughtering plants in or on the live animals and personnel, and there are no inspection procedures specifically directed toward these organisms. (Saide-Albornoz et al., 1995).

Table 1. *Salmonella* sp. in different types of products of meat origin.

	Number of Samples examined	number of positive samples	Serotypes and number of strain isolated
Raw	357	33	*Anatum* (22) *Derby* (14) *Hadar* (2) *Give* (2) *Lexington* (1) *London* (1) *Infantis* (1) *Panama* (1) *Saint Paul* (1)
Salted	186	4	*Agona* (1) *Anatum* (2) *Derby* (2)
Cooked	293	2	*Derby* (1) *Infantis* (1)
Total	836	39	

Notes: In 4 samples of raw products more than one serotype was isolated.

Table 2. *Salmonella* sp. in meat origin products classified by origin of type of raw material.

Class of raw material	Raw	Salted	Cooked	%
Cut meat	7	0	1	23
minced/cut meat/ half carcass	7	0	0	20
Minced	6	2	0	19
Cut/minced	4	2	1	15
Half carcass/minced	6	0	0	15
Half carcass/cut meat	3	0	0	8
Half carcass	0	0	0	0
Ham	0	0	0	0
Self supply plants**	0	0	0	0
Total	33	4	2	100

**Plant with complete process in the sausage (sacrifice animals, cut meat, addition additives, and fulfilled their complete cycle).

In our study was no possible identify the meat source of *Salmonella.* Products of meat origin are manufactured with different mixtures of beef and pork. Moreover, different spices are added to them (paprika, peeper, desiccated chile and salt).

It is important to remark the difference observed in our survey among the products classified as: raw, cooked and salted in the detection of *Salmonella*. *S.derby* was found from samples of all the three groups, while *S.anatum* only was found in salted foods. Almost 10% of the products of meat raw origin, results positive to the isolation of *Salmonella* in our survey, this means that it will be necessary to keep controlling their presence in foods. Muscle tissue and most edible organs are sterile in the living animal. Contamination of meat occurs during the dressing process, when bacteria are transferred from the skins and the guts or carcasses to the freshly exposed meat surfaces. (Gill, 1995).

Raw foods of animal origin may be the most important source of foodborne pathogens (Eyles 1995). The hazards associated with compromised persons will command increasing attention from manufactures, who provide many products aimed at sectors of the population with special health problem. (Eyles 1995).

Products that are expended crude had the greater positive samples percentage of *Salmonella* recovery, those «cured» with salt, decreased the isolations of *Salmonella*, while in the boiled it could not be evidenced the presence of these microorganisms. Salted products, containing salt in high concentration,

would prevent the surviving of *Salmonella*. The inhibitor effects for grow of Salmonella that produces the salting on the foods is total in those foods that are submitted to a heat treating after their manufacture and before their sales to the public (pre-cooked).

It is important to signaling the difference among samples when considering the origin of the foods concerning theirs processing (complete cycle in the factory: from the animal sacrifice to the sale of the packed product) with those that used half carcasses, cuts, etc. In those factories that were self-supply (fulfilled their complete cycle in the factory), was not possible to evidence the presence of *Salmonella*. The same occurs with those that only used half carcasses or hams. This might be a clear evidence that when more step are added to the preparation and different plants are involved, there are more possibilities that products be contaminated with pathogens.

Those establishments that prepares food with minced meat, showed the greater contamination rates, those which were using minced meat jointly with cut (in fragments) or carcasses, continued in importance. Hygienic practices were to be promoted by the building of model abattoirs with proper toilet facilities for workers, adequate supplies of water for plant cleaning, effective actions of removing waste, and suitable meat storage facilities.

Our results suggest that the quality of the ingredients in the elaboration of this kind of food should be continuously monitored also to control the critical points in the production line, since the serotypes isolated are common to human and not human sources (animal, water and foods). A detailed longitudinal study that continued to the animal from the sacrifice until the meat production will be necessary.

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