

Identification of *Listeria sp.* in Hams and Frankfurters Products Exhibited for Sale

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Abstract: The aim of this study was to analyse the occurrence of *Listeria* species in frankfurters and hams products packed under vacuum and exhibited for sale in Mexicali, Baja California. One hundred and eighty-two packages of frankfurters and 72 of hams belonging to 17 commercial brands were collected randomly among packages exposed for sale, according to simple randomized sampling. The sampling was carried out between May and November. Positive samples of *Listeria* were submitted to biochemical tests in order to differentiate and confirm their species. Sixteen point five percent (42/254) presented some species of *Listeria*: 19.2% in frankfurters (35/182) and 9.7% in hams (7/72) products. *L. monocytogenes* was identified from 19 of 182 frankfurters and only 1 of 72 hams products analysed. Other species of *Listeria* were detected in 16 frankfurters samples (8.8%) and in 6 of the hams (8.3%). Presence of *L. monocytogenes* in these kinds of meat products, specifically frankfurters product, suggest inefficiency and inefficacy in the microbiological control programs during the process of elaboration. Thus, it should be considered possible source of listeriosis.

Key words: *Listeria monocytogenes*, *Listeria sp.* frankfurters, hams, microbiological, listeriosis

INTRODUCTION

In several ready-to-eat food products, such as meat products: frankfurters, hams, mortadellas among others, in salted sea products and in cheeses, *Listeria sp.* particularly *L. monocytogenes* and *L. innocua*, have been found. Listeriosis (Gombas *et al.*, 2003) is a disease caused by *L. monocytogenes* and the symptoms can vary from abortions or premature births, neonatal sepsis, septicemias, meningitis and encephalitis (Lovett and Twedt, 1988; Rodríguez *et al.*, 2004).

The presence of *Listeria sp.* in meat products have been associated with the contamination in the food processing environment, such as contact with dirty surfaces, repackaging, cross contamination among employees handling different processes, re-contamination with the exudates of the products themselves, among others (Wenger *et al.*, 1990; Wang and Muriana, 1994; Wonderling and Bayles, 2004). Furthermore, the control of *L. monocytogenes* in foods is difficult due to its ability to grow over a wide range of temperatures (3-45°C), pH (4.8-9.6), high levels of sodium chloride and sodium nitrite and to its resistance to most of the disinfectants (Soriano *et al.*, 2001; Tomas and Wimpenny, 1996).

In the United States, listeriosis has been associated to the consumption of frankfurters and other meat

products (Center for Disease Control and Prevention, 2002) hence the rejection of the products by the departments of health inspection and their removal from the supermarkets. Therefore, the Department of Agriculture (USDA) of the United States demands a total absence of *L. monocytogenes* in cooked meat products (Islam *et al.*, 2002). Unfortunately, in Mexico there do not yet exist rules to regulate the absence of this bacteria in food.

Due to the high demand of consumers in Mexicali, Baja California for refrigerated ready-to-eat meat products, especially frankfurters and hams and to the potencial risk of their contamination, a periodic microbiological inspection of these products has been brought about.

The aim of this study was to analyse the occurrence of *Listeria sp.* in frankfurters and hams products packed under vacuum and exhibited for sale in Mexicali, Baja California.

MATERIALS AND METHODS

A total of 254 frankfurters and hams products packed under vacuum and exhibited for sale in Mexicali, Baja California were included. The packages had a weight between 240 and 454 g and belonging to 17 commercial brands. The total sample was collected randomly from

Table 1: Frequency of *Listeria* species in frankfurters and hams

<i>Listeria</i> sp.	Frankfurters (n = 182)	Hams (n = 72)
<i>L. monocytogenes</i>	19(10.40%)	1(1.40%)
<i>L. innocua</i>	8(4.40%)	n/d
<i>L. welshimeri</i>	5(2.70%)	n/d
<i>L. ivanovii</i>	n/d	2(2.80%)
<i>L. grayis</i>	2(1.10%)	2(2.80%)
<i>L. seeligeri</i>	1(0.50%)	2(2.80%)
Total	35(19.20%)	7(9.70%)

packages exhibited for sale from 23 supermarkets, according to simple randomized sampling. The sampling was carried out during a period of seven months between May and November. Once the packages collected, they were transported at refrigeration temperature to the laboratory for their analyses. From each package, 25 g were taken to be introduced into sterile stomacher bags diluted with 225 mL of enrichment broth *Listeria* (Difco Laboratory, Michigan, U.S). The sample was homogenized using the stomacher (Seward, 400, London, U.K.) during 2 min and subsequently incubated for 24 h at 30±2°C. For isolation and identification of the *Listeria* sp. the microbiological analyses were conducted using the technique described by USDA/FSIS (2002). Frequency tables per *Listeria* sp. were constructed both frankfurters and hams products. PROC FREQ from SAS software was used (SAS, 2004).

RESULTS

From the total of the analyzed samples, sixteen point five percent (42/254) presented some species of *Listeria*: 19.2% in frankfurters (35/182) and 9.7% in hams (7/72) products, respectively (Table 1). *L. monocytogenes* was identified from 19 of 182 frankfurters and only 1 of 72 hams products analysed. Other species of *Listeria* were detected in 16 frankfurters samples (8.8%) and in 6 of the hams (8.3%).

DISCUSSION

Frankfurters presented the largest populations of *Listeria* spp of the evaluated meat products. Particularly, *L. monocytogenes* was mostly identified in this product (10.4%), the highest value for the reports of Wang and Muriana (1994) with 8%, Porto *et al.* (2002) with 6%, Soriano *et al.* (2001) with 4.9% and Luchansky *et al.* (2002) with 3.3%. In hams, the percentage of positive samples for *L. monocytogenes* (1.4%) in this study was lower than the reports of Grau and Vanderlinde (1992) with 13.71% and of Soriano *et al.* (2001) with 4.9%. These finds must be unusual at having a systematic control program for the prevention of ecological niches as well as means of health control of *Listeria* sp. in the environment. The identification of several *Listeria* species may be attributed to recontamination generated by the personnel or from the fluids subsequently to the

process of cooked and repackaging (Johnson *et al.*, 1990; Tompkin, 2002; Wonderling and Bayles, 2004).

If *L. monocytogenes*, *L. innocua* and *L. ivanovii* are of fecal origin and can live in the environment of the establishments, their presence may be attributed to the large amount existent so that they come to contaminate the food during its processing. The relation present among *Listeria* sp. with *L. monocytogenes* is very close. MacGowan *et al.* (1994) and pointed out that the detection of *L. monocytogenes* with respect to the other species indicates the presence of a potential pathogen, whereas if the identification is of *Listeria* sp. it would indicate the beginning of a potential risk of contamination with *L. monocytogenes*. The aforesaid obliges to evaluate each point of the elaboration process of meat products and to define control programs for the absence of this pathogen in the environment.

Because of the importance of *Listeria monocytogenes* in public health, in other countries, like in the United States, the health agency stipulate total absence of *L. monocytogenes* levels in CFU/25 to 50 g of frankfurters and ready-to-eat food (Knabel, 2002) in Mexico, there is still no regulation, ruling the absence of this bacteria.

L. innocua was identified in 4.4% of the frankfurters (8/182), percentage higher than that reported by Kerr *et al.*(1990) with 3%, but lower than the finds of Grau and Vanderlinde (1992) with 6.28%. Though this species is very common to be found in meat and meat products, it is not pathogenic and its presence in food does not mean a risk for health (Kathariou, 2002).

L. welshimeri was identified in 2.7% of frankfurters samples (5/182). With regard to this, the species are considered a common contaminant of the environment in the establishments, where the product is processed and is not deemed pathogenic (Johnson *et al.*, 1990). The occurrence of *L. innocua* and *L. welshimeri* in meat products such as frankfurters indicates failures in the thermal processes of cooking with respect to time and temperature, or maybe contamination of the equipment (Kerr *et al.*, 1990; Aymerich *et al.*, 2000, Choi *et al.*, 2001; Soriano *et al.*, 2001).

The difference in the results of *Listeria* in its different species found for ham vs. frankfurters probably was mainly due to the differences in the processes of formulation and elaboration of these products (Grau and Vanderlinde, 1992).

CONCLUSION

Presence of *L. monocytogenes* in these kinds of meat products, specifically frankfurters product, suggest inefficiency and inefficacy in the microbiological control programs during their process of elaboration. Thus, it should be considered possible source of listeriosis.

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