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Ciencias Biológicas

PRESENCIA DE *Salmonella spp.* EN ALIMENTOS DE LA COSTA ECUATORIANA

PRESENCE OF Salmonella spp. IN FOODS FROM THE ECUADORIAN COAST

PRESENÇA DE Salmonella spp. EM ALIMENTOS DA COSTA EQUADORIANA

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Resumen

Algunas regiones de Ecuador, especialmente la provincia de Manabí reporta un alto número de casos de salmonelosis. Es por ello que en el presente trabajo se examinó, mediante análisis microbiológicos, la presencia de Salmonella spp., en alimentos comercializados en el centro de la ciudad de Manta (provincia de Manabí), de acuerdo a las normas INEN. Ocho de las doce muestras de alimentos analizadas contenían Salmonella spp. El 30% de las muestras de jugo de fresa mostró presencia de Salmonella spp., seguido del jugo de zanahoria (16,7%), agua potable (14,3%), jugo de naranja (13,3%), queso artesanal (7,1%), hamburguesas (6,7%), pescado marinado. (3,6%) y longaniza (2,8%). Los alimentos que no se procesan o almacenan adecuadamente podrían ser responsables de la contaminación por Salmonella en Manta, Ecuador.

Palabras clave: Ecuador, comida de la calle, Manta, Salmonelosis

Abstract

Some regions in Ecuador, specially Manabí province, reports high number of Salmonellosis cases. The present work examines the presence of Salmonella spp. in food commercialized in the city centre of Manta (Manabí province), according to INEN regulations. Eight of the twelve food analysed samples contained Salmonella spp. 30% of the strawberry juice samples showed presence of Salmonella spp., followed by carrot juice (16.7%), potable water (14.3%), orange juice (13.3%), artisanal cheese (7.1%), hamburgers (6.7%), marinated fish (3.6%) and sausage (2.8%). Foods that are not properly processed or stored could be responsible of Salmonella contamination in Manta, Ecuador.

Keywords: Ecuador, street food, Manta, Salmonellosis

Resumo

Algumas regiões do Equador, especialmente a província de Manabí, relatam alto número de casos de Salmonelose. O presente trabalho examina a presença de Salmonella spp. em alimentos comercializados no centro da cidade de Manta (província de Manabí), segundo as normas do INEN. Oito das doze amostras de alimentos analisadas continham Salmonella spp. 30% das amostras de suco de morango apresentaram presença de Salmonella spp., seguido de suco de cenoura (16,7%), água potável (14,3%), suco de laranja (13,3%), queijo artesanal (7,1%), hambúrguer (6,7%), peixe marinado (3,6%) e linguiça (2,8%). Alimentos que não são processados ou armazenados adequadamente podem ser responsáveis pela contaminação por Salmonella em Manta, Equador.

Palavras chave: Equador; comida de rua; Manta; Salmonelose.

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1. Introduction

Ecuadorian Ministry of Health has a register of diseases from food intake among others. A high number of people suffering of Salmonellosis has been identified in Ecuador year after year. Only on the last three years, between 1710 and 3373 cases were identified (Ministerio de Salud Pública, 2014, 2015, 2016, 2017, 2018). Manabí province showed the highest percentage of Salmonellosis cases within Ecuador. Processing and commercialization conditions of artisanal and street food may not fulfil Ecuadorian regulations, leading to the presence of pathogen microorganisms like Salmonella spp. in artisanal cheese among other food products (Zambrano, 2014). Previous studies showed the presence of this microorganism in Ecuadorian food, like eggs (Estrada and Valencia, 2012), meat foods (Rodríguez and Silva, 2017) and chicken (Japón, 2019; Villarreal, 2017; Melo, 2015). However, to date no studies have been done about the presence of commercialized foods in the province of Manabí.

Based on the previous information, the present study examines the presence of Salmonella spp. in food commercialized in the city centre of Manta (Manabí, Ecuador).

2. Materials and methods

Food samples for identification of Salmonella spp. presence were chosen previously, based on studies in Latin-American countries (Yánez et al., 2008; Charles-Hernández et al., 2005; Carrera et al., 1998; Calderón, 2006) that identified food as a source of Salmonella. Samples of sausage, marinated fish (ceviche), artisanal cheese, mortadella, grilled chicken, meringue for bakery, commercial ice, orange juice, strawberry juice, carrot juice and hamburgers were purchased from restaurants, stores or from street sellers from the center city of Manta, Ecuador. Potable water was collected from houses located in the city center.

The number of third and fourth category restaurants to be used for sampling was obtained from the Municipality of Manta, which was 154 restaurants. Since there was no data about the number of street sales found in the city, a total sample of 154 establishments was established. However, only 125 street sales could be located.

Samples were taken in triplicate for 3 consecutive weeks. The food only entered the laboratory if it met the following criteria: a) Food sample should be at refrigeration temperature (2-8 °C) b) Sample was taken within 24 h before the analysis c) Food sample was packaged in plastic bags within a container.

2.1 Presence of Salmonella spp. in food

The analyses to determine presence of Salmonella spp. were done according to the norm NTE INEN (INEN, 1996). 25 g of sample were inoculated with 225 ml peptone solution (1 g/L peptone, 8.5 g/l NaCl) and incubated at 37°C for 2 h. 1 mL of the prepared sample was inoculated in Rappaport and tetrathionate solution. Afterwards, the solutions were plated in Salmonella-Shigella agar culture medium (HiMedia Laboratories, India) and incubated at 37ºC for 24 h. Salmonella spp. colonies were identified visually.

3. Results and discussion

Table 1 showed that eight of the twelve food samples contained Salmonella spp. Strawberry juice had the highest presence of Salmonella spp. with 30% of positive samples, followed by carrot juice with 16.7%, Potable water (14.3%), orange juice (13.3%), artisanal cheese (7.1%), hamburgers (6.7%), marinated fish (3.6%) and sausage (2.8%).

The presence of Salmonella spp. in fruit juices, cheese, hamburgers, marinated fish and sausages may be due to excessive food handling, lack of potable water for a proper wash of food and cookware and lack of refrigeration conditions to storage cheese and minced meat. Street food are prepared without adequate hygienic conditions such as raw materials of dubious origin, inappropriate storage, use of contaminated clothes such as coats, gloves, hats or face masks, recycling of frying oils or cooking water, inadequate disposal of waste, presence of rodents and the absence of sanitary services for the manipulators, are a perfect setting for the spread of infectious agents. Temperature in Manta vary between 21 and 29 °C along the year, therefore time and temperature may facilitate the reproduction of contaminating microorganisms in raw materials (Méndez et al., 2010).

There are very few studies in Ecuador about the presence of Salmonella spp. in food. This information may help to the Ministry of Public Health to prevent and control Salmonellosis in Ecuador by improving processing and storage conditions of commercialized food.

Similar studies carried out in Colombia by Yánez et al. (2008) and Durango et al. (2004) have shown that between 5.3 and 7.9% cheese samples were contaminated with Salmonella spp. Yánez et al. (2008) found 12.35% of sausages contaminated with Salmonella spp., whereas Durango et al. (2004) found presence of the microorganism in 7.9% of the samples. Sausages may show different results due a different kind of sausage used during the study. Despite the low pH of the fruit juices analyzed in this study, Salmonella still was present. This was also found in 37.7% of the fruit juices (banana, melon, watermelon and strawberry) with a pH range between 2.25 and 4.39, analyzed by Ávila and Fonseca (2008). Certainly a low pH is not enough to get free of Salmonella, therefore people should be alert on consumption of ceviche, based on marinated fish, which is consumed exclusively in Manabí province.

The results obtained in the city of Manta identify street food as a high health risk source. Possibly, this is due to the long time between food preparation and consumption, the limited storage conditions, and the frequent lack of potable water. All these factors should be considered in a seller health training. It is necessary greater control by the corresponding authorities and more information and training for sellers and consumers of this type of food.

Table 1. Presence of *Salmonella* spp. in food commercialized in the city center of Manta

Food	Number of samples	Presence of *Salmonella* spp. (%)
Sausage	36	2.8
Marinated fish (ceviche)	28	3.6
Ecuadorian artisanal cheese cheese	28	7.1
Potable water	21	14.3
Commercial ice	9	0
Mortadella	36	0
Grilled chicken	27	0
Meringue for bakery	27	0
Orange juice	30	13.3
Strawberry juice	30	30
Carrot juice	30	16.7
Hamburgers	75	6.7
Total	377	5.8

4. Conclusions

The results of this study demonstrate the presence of Salmonella spp. in street food commercialized in center city of Manta, Ecuador. Probably raw materials of dubious origin and inadequate processing or food storage are a perfect setting for the spread of infectious agents such as Salmonella spp. Strawberry juice had the highest presence of Salmonella spp. with 30% of positive samples, followed by carrot juice with 16.7%, potable water (14.3%), orange juice (13.3%), artisanal cheese (7.1%), hamburgers (6.7%), marinated fish (3.6%) and sausage (2.8%). These street foods constitute a risk to public health. It is necessary a greater control by the corresponding authorities and more information and training for sellers and consumers of this type of food.

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5. Conflict of interest

We have no conflicts of interest to disclose.

6. References

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Contribución de autor

Autor	Contribución
Stalin Santacruz	Parte experimental, elaboración del manuscrito