

# The first notification of *Salmonella* Budapest in Portuguese meat products: a case report

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## Abstract

*Salmonella* is a bacterium that can cause an illness in humans called salmonellosis. In the European Union, over 100,000 human cases were reported last year. The EFSA has estimated that the overall economic cost of human salmonellosis could be as high as EUR 3 billion a year.

In the present study, *Salmonella* spp. analyses based on ISO 6579:2002, was derived as a part of a HACCP procedure in a meat processing company. From the four analyzed samples, dry cured sausage, black pudding, fresh sausage and meatloaf, *Salmonella* sp. was isolated in the last two samples. Both isolates were sent to the Portuguese Reference Laboratory for Salmonella (Instituto Nacional de Saúde Dr Ricardo Jorge – INSA) and serotyped according to the Kauffmann-White scheme. *Salmonella* Budapest was identified in both products. This result may indicate a common source of contamination for both products that may occurred in the production chain. Using rastreability data it was possible to observe that the meat used in both products was from national swine slaughtered in Portuguese abattoirs. According to data provided by INSA, until 2012, besides these two *Salmonella* Budapest isolates, were only recorded two more cases isolated from sausage and frozen gizzards from Brazil.

With regard to Portuguese human data, in the last decade, there was five cases of *S. enterica* serovar Budapest infection that were related to gastroenteritis and only one associated with pyogenic skin lesion. This data suggests that we may be facing an isolated case of cross-contamination in the production line due to poor equipment hygiene throughout the chain. Additional studies are being made to understand dangerous strain with regard to virulence profile and antimicrobial resistance.

## Introduction

*Salmonella* is a bacterium that can cause an illness in humans called salmonellosis. It is an almost universally accepted dogma that human salmonellosis is a zoonosis<sup>(1, 2, 3)</sup> and is a major cause of bacterial enteric illness in both humans and animals<sup>(4)</sup>. A high percentage of *Salmonella*-positive samples of ground meat from swine (40.3%) and cattle (46%) and of processed poultry products (56.3%) implies that a consumer has a 50:50 chance of carrying home live *Salmonella* with these products from the supermarkets<sup>(5)</sup>. *Salmonella* strains from food animals are passed to the human population via insufficiently cooked meat, eggs, and milk<sup>(3)</sup>. Since enteric infections with *Salmonella* in humans result in multiplication and excretion of the infectious agents in and from the human intestine, the animal-food-human spread must be regarded as an important contribution to the release of antibiotic-resistant bacteria from farm animals<sup>(6, 7)</sup>. In 1997, the World Health Organization for the first time ever published a report on the medical impact of the use of antimicrobials in food animals<sup>(8)</sup>. The main threats were formulated as: (a) an increase in the prevalence of resistant bacteria in animals; the transfer of resistant pathogens to humans via direct contact with animals, or through the consumption of contaminated food or water; (b) the transfer of resistance to human bacteria; (c) an increase in the incidence of human infections caused by resistant pathogens; (d) potential therapeutic failures in animals and humans; and (e) frightening resistance situations in farm animals regarding *Salmonella*, *Campylobacter*, *Enterococcus* species and *E. coli*. In these study was serotyped two strains of *Salmonella* Budapest according to the Kauffmann-White scheme, on the basis of serologic identification of O (somatic) and H (flagellar) antigens<sup>(9)</sup> and was made an antimicrobial resistance profile based on CLSI information.

## Material and Methods

### 1. Sampling

Sampling procedure was done randomly during the HACCP actions in a butcher for resale area from one meat processing company. Four meat samples were analyzed: dry cured sausage, black pudding, fresh sausage and meatloaf. The material was collected in full for sterile bags and transported to the laboratory under controlled temperature (4° C) during 24 hours.

### 2. Detection of *Salmonella* spp.

The detection of *Salmonella* spp. was made according to the method ISO 6579:2002 on accredited laboratory by IPAC (L0352) <sup>(10)</sup>.

### 3. Serotyping of *Salmonella* spp.

The serotyping was performed at the National Reference Laboratory according to the methodology of slide agglutination and tube. This methodology is described to be unique and not disclosed by the laboratory where it is held, as it is the only laboratory at the national level to accomplish the same.

### 4. Susceptibility to antibiotics

The antimicrobial resistance profile was treated using the disc diffusion method based on NCCLS:M31-A2 (11).

## Results

From the four analysed samples, two were positive for *Salmonella* spp (Table 1.). Both strains were serotyped (Table 2.).

It was confirmed that it was the same serovar and was done the antibiotic susceptibility profile. The results are presented in Table 3.

## Discussion

Processed meat products analyzed were produced from portuguese pork meat, whose process of fattening, slaughtering and butchering was also carried out on national territory.

The fact that the same *Salmonella* serovar has been isolated from two different meat samples produced in the same production line, point out this step as a possible common source of contamination and suggests that should be an improvement in the disinfection scheme and further analysis to demonstrate the effectiveness of this process which, however, does not was held at the express wish of the customer.

After identification of *Salmonella* Budapest, there was a broad literature search and wasn't found any references to this serovar in Portugal. For that, INSA was personally contacted that confirmed that this was the first case of contaminated Portuguese meat with *Salmonella* Buda-

**Table 1.** Results of *Salmonella* spp. detection

Sample #	Sample name	Method	Result	Units
1	Dry cured sausage	ISO 6579:2002	Absent in 10g	Present/absent in 10g
2	Black pudding		Absent in 10g	
3	Fresh sausage		Present in 10g	
4	Meatloaf		Present in 10g	

**Table 2.** Results of the serotyping

Sample #	Sample name	Parameter	Method	Result
3	Fresh sausage	<i>Salmonella</i> spp serotyping	Agglutination	Salmonella enterica serotip Budapest
4	Meatloaf			

**Table 3.** Antibiotic susceptibility to *Salmonella* Budapest (S –susceptible; I – Intermediate; R- resistant).

CLSI Class	Antimicrobial Agent	Result
Aminoglycosides	Kanamycin	S
	Gentamicin	S
	Streptomycin	R
β-lactam	Amoxicilin	S
Penincilin	Ampicillin	S
	Penincilin	R
Cephems	Ceftiofur	S
Folate pathway inhibitors	Thrimethropin-Sulfametoxazol	I
Quinolones	Ciprofloxacin	S
	Enrofloxacin	S
	Nalidixic acid	S
Phenicols	Sulfamid	R
	Chloranphenicol	S
Tetracyclines	Tetracyclin	R
	Doxiciclin	R

pest. However, two cases from meat imported from Brazil were previously reported (personal communication). To draw the profile of susceptibility to antibiotics confirming that it was a resistant strain to important groups (Table 3).

### Conclusion

The presence of one serovar in separate products in the same production line confirms ineffectiveness of the hygiene methods and suggests a revision of the HACCP since the presence of *Salmonella spp.* in meat products disrespects legislation (12).

The appearance of this new serovar in Portugal, confirms the high mobility of bacterial strains so far in the case of *Salmonella enterica* Budapest confined to northern Europe to countries further south. This mobilization may be due to high transaction of live animals and carcasses within Europe, especially between countries of Eastern Europe, where traceability systems are deficient.

The antimicrobial resistance profile obtained confirms that this is an highly harmful bacterial strain which corroborates the fears already shown in other studies that warn of the risk of ineffectiveness of antimicrobial treatments in human nature, these strains represent a risk for increasing public health.

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