NATIONAL PREVALENCE OF SALMONELLA SPP. IN PORK SLAUGHTERHOUSES UNDER FEDERAL INSPECTION IN BRAZIL, 2014/2015

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Introduction

Meat consumption is frequently associated with foodborne diseases. The onset of such occurrences may be due to failures on animal health surveillance or during meat processing. Many efforts are made in the industry to minimize any kind of meat contamination which can affect human health. Salmonella has an important role in the public health and economy, once it is recognized as one of the most important zoonosis (Valero et al., 2014). In Brazil, 90% of reported cases involving foodborne pathogens, in which the pathogens were identified, from 2007 to 2016, were caused by Salmonella spp. (Brazil, 2016).

Brazilian pork meat has an important representativeness in the global market, since the country is currently the 4th largest pork producer and exporter in the world (ABPA, 2015). In 2014 and 2015 the official veterinary service, under the Ministry of Agriculture, Livestock and Food Supply (MAPA), conducted a national baseline survey, sampling establishments under Federal Inspection Service (SIF) to estimate the prevalence of Salmonella spp. on pork carcasses at the pre-chilling and at the post-chilling phases (Brazil, 2014).

The present study aims to estimate the prevalence of Salmonella spp. in Brazil during the years of 2014 and 2015 by quantifying levels of the pathogen in pork carcasses and by identifying which sizes of establishments were the most involved in the contamination through data analysis.

Material and methods

In order to estimate the prevalence in slaughterhouses, a two-level sampling (establishments and carcasses) was used, in which their respective sample weights were implemented to increase the external validity of the data. For the definition of the sampling plan, abattoirs under federal inspection had the following classification according to their slaughter capacity: Small (S), for up to 200 pigs slaughtered per day; Medium (M), for 201 to 700 pigs slaughtered per day; Large (L), for 701 to 1,800 pigs slaughtered per day and Very Large (VL), for 1,801 or more slaughtered pigs per day. The purpose of the classification of establishments was to have a proportionality between the number of samples to be collected in relation to the magnitude of the production, which were: S = 4; M = 8; L = 12 and VL = 16. Two samples were collected after random selection of two half-carcasses from 76 slaughterhouses, one before chilling (BC) and another 12 hours after chilling (AC). Samples were collected on carcasses using swabs, aseptically, in a total area of 400 cm², using sponges at standard points such as belly, jowl, ham and loin (Brazil, 2014).
The study was conducted from October/2014 to June/2015. During the sample collection period there were approximately 128 establishments slaughtering over 32 million pigs.

A total of 1.487 samples were analyzed for *Salmonella* spp. in official laboratories (LANAGRO) using ISO methodology (ISO, 2002).

Data were stored in spreadsheets and georeferencing of the establishments was performed through the TerraView 4.2.1 program (São José dos Campos, SP: INPE, 2012), after verification and adjustments. Moreover, the establishments were labeled according to their respective markets, in which they could be exporters or not. The program used for analysis was Stata 12.0 (Stata Statistical Software: Release 12. College Station, TX: StataCorp LP).

**Results and discussion**

The results obtained were 10.00% (CI 7.50-13.22) of BC carcasses positive for *Salmonella* spp.. Establishments classified by size as M were the major responsible ones, with a prevalence of 18.51% (CI 9.27-33.56) and there was a marginally significant difference (p = 0.051) between this category of abattoirs in relation to the others, regarding positivity (BC). Establishments limited for national market (NM) had an observed prevalence of 17.43% (CI 12.00-24.63), while in those qualified for international market (IM) the prevalence was 9.05% (CI 6.39-12.66).

For the AC carcasses, the prevalence was 4.58% (CI 3.13- 6.65) and there was not a statistical significant difference of positiviness between the other categories. In establishments for NM the prevalence was 12.25% (CI 7.75-18.81) and for IM was 3.57% (CI 2.15-5.89).

According to (Arguello *et al*., 2012), *Salmonella* contamination is particularly higher in many points of the slaughtering process in the pork production chain in Spain, including the conditions of animal transportation, holding pens, and several points of the slaughtering line, due to the high number of animals raised in different systems and regions. A Brazilian study in Santa Catarina state has shown similar results about the chance of *Salmonella* positiveness in the slaughterhouses being bigger, it is relative to the finishing step that is responsible for enhancing *Salmonella*-transmission and the high number of carries responsible for the delivery of pig batches to slaughterhouses (Kich *et al*., 2011).

The georeferencing allowed a better visualization of the distribution of these establishments in Brazil (Figure 1), strengthening the need of actions regarding epidemiological surveillance. In Brazil, 51.56% (66/128) of pork slaughterhouses under federal inspection commercialize their products only to national market (NM) and 48.44% (62/128) are approved by MAPA to national and international market (IM), attending several countries in the world.
Conclusion

It was possible to establish the association between sample positivity and the geographical location of the occurrence, as well as the size of the abattoirs with their respective markets served. The determination of this scenario allows MAPA to perform actions aimed at risk mitigation with a greater assertiveness.

The information and knowledge acquired may support further investigations and evaluation of surveillance programs developed by the official veterinary service to guarantee food safety.

Figure 1. Spatial distribution of pork slaughterhouses under federal inspection in Brazil. Blue: Internal market establishments; Red: External market establishments.
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References


