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ROLE OF VECTORS IN TRANSMISION OF *SALMONELLA* IN PIG FARMS

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Abstract

Vectors represent an important role in the transmission of Salmonella in pigs by introducing these microorganisms on farms, constituting source of contamination or receptors in the existing infections on farms. In order to emphasize the role of vectors in the transmission of Salmonella in pigs, in the present study was started by collecting and analyzing samples of faeces from pigs, and vectors (rats / mice, birds, insects) nearby.
Out of 100 collected faecal samples from pigs, a total of 40% (40/100) of samples were positive Salmonella spp. Analyzing the 50 samples of stool collected from mice and rats, it was found a total of 30% (15/50) positive samples, from birds of the 50 samples collected 26% (13/50) samples were positive, and of the 30 insects analyzed, 20% (6/30) samples were positive for Salmonella spp.
The most common serovars isolated by means of API 20 E, such as pigs and vectors were S. Typhimurim, and S. Choleraesuis, S. Derby was isolated only in pigs.
Based on these results we can say that the vectors constitute an important role in the spread of Salmonella in pig farms, but the role of rodents seems to be more relevant to other vectors in the study (birds, insects).
Therefore to reduce the risk of contamination of pigs with Salmonella spp. are necessary for the application of control measures on farms.

***Key words**: Isolation, pigs, Salmonella spp, serovars, vectors.*

INTRODUCTION

Because of the association of the presence of *Salmonella spp*. in products for human consumption, and their presence in livestock, it is necessary to implement measures to control the introduction and spread of infection in livestock (Wegener et al., 2003).
Epidemiological studies have shown that the purchase bearing animals and contaminated feed are important factors for introducing *Salmonella spp.* in livestock (Stark et al.,. 2002
After several studies, *Salmonella spp.* was isolated from wild birds, rodents, hedgehogs and insects (Refsum et al., 2002; Handeland et al., 2002; Mian et al., 2002).
Salmonella spp. transmission from wild birds in the environment and from other animal species has been observed in several studies (Kapperud et al., 1998).
In some countries, there was an increased prevalence of Salmonella spp. in wildlife (Refsum et al., 2002), which has led some authors to support the hypothesis that wildlife plays an important role in the transmission of *Salmonella spp*. horizontally (Liebana et al., 2003).
Most serovars of *Salmonella spp.* have an important role in the emergence of animal diseases from spreading through the digestive tract of animals both domestic and wild animals which are considered vectors in the transmission of Salmonella spp. (Angulo et al., 2004;. Schlundt et al., 2004).
Following the completion of studies, *Salmonella spp.* was isolated from the

digestive tract of domestic animals other than farm (dogs, cats) (Van Immerseel et al., 2004). A part of the isolated serovars, such as *S*. Eyphimurium and *S*. Enteritidis are pathogenic both for animals and humans ((Van Immerseel et al., 2004).
The presence of excessive rodents (rats and mice) are considered indicators of inadequate disinfestation (Murray et al., 2000).

MATERIALS AND METHODS

The study was conducted between September and December 2014 in two pig fattening farms, where it has been studied the importance of *Salmonella* in pigs transmission by vectors (birds, rats. insects).
There have been a number of 100 samples collected faeces from pigs prior to slaughter, 50 samples taken from pigeons, 30 rats / mice and 30 insects.
Pigeons were caught using nets when they came to food, rats / mice were captured by placing traps both inside and outside the shelter after that they were placed in a plastic bag and brought to the laboratory for analysis and insects were trapped by adhesive strips.
Faecal samples were collected from pigeons cloaca with sanitation sticks and mixed with 10 ml of buffered peptone water, the rats / mice (laboratory) were collected 1 g of faeces were homogenized in 9 ml peptone water. Insects, before being analyzed were frozen at - 20 ° C for one hour, where one 1 gram was stirred with buffered peptone water, providing a volume of 10 ml (according to the study conducted by Skov M.N et al., 2008).
Examination of samples was performed in the laboratory of hygiene, bacteriological method SR EN ISO 6579/2002 / AC / 2007 (Annex D) and serovars identification was performed using API 20 E method.

RESULTS AND DISCUSSIONS

After analyzing the 100 faecal samples collected from pigs in the phase of fattening, it was found some 20% positive samples.
Analysis of the 50 samples collected from the birds, revealed a 26% prevalence of positive samples. Skov et al., 2008 from a study achieved a 15% prevalence of positive samples (20) of the 1285 samples from several species of birds examined.
Raul C. Mainar Jaime, 2013, following the completion of a study by examining the impact of poultry farms around pigs and not only, isolated *Salmonella spp*. in samples 1.85% (15) of the 810 samples analyzed. The results of the analysis of stool samples (50) collected from the rats / mice, 30% of samples were positive (Figure 1), similar results were obtained and Skov et al., 2008, where after analyzing the 135 faecal samples from rats, the authors obtained a total of 70 positive samples (52%).
Similar study was carried out and Somyanontanagul, 2009, where of 11 fecal samples collected from rodents, 5 (45.45%) were positive for *Salmonella spp.* (Card, 2009).
Barber et al., 2002 isolated *Salmonella spp.* in 5% of the 180 mice caught around farms, noting that of the 12 farms taken in the study, nine of them pigs excreted microorganisms of the genus *Salmonella.* On the other hand Jensen et al., 2004, after analyzing samples from rodents, have not achieved any positive
The samples collected from insects, of the 30 samples analyzed, we obtained a total of six (20%) positive samples, and similar results were obtained by Skov et al., 2008, where seven of the 21 samples analyzed samples (22.6%) were positive.

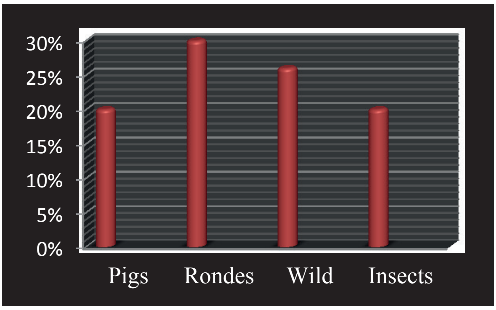

Figure 1. Correlation of positive samples *Salmonella spp.* from pigs, rondes, birds and insects

Following a study made by Andres-Barranco et al., 2014 in 41 pigs farms, the authors isolated *Salmonella spp*. in 56.1% of the fecal samples taken from pigs, 21.4% of the samples taken from the bird and 46.2% of the samples of rodent.

The authors found that pigs carriers have important role in the spread of *Salmonella spp*. in the environment, the source of infection in pigs free of *Salmonella spp*., but depends largely of the present of rodents and birds on the farms.

Following a study by Jorgensen, 2002, in Denmark, the author observed a low prevalence of *Salmonella spp*. in samples taken from poultry carcasses surface. Barber et al., 2002 showed that only 6% of the samples of the insects were positive, while Bailey et al., 2001 obtained a prevalence of 18.7% with *Salmonella spp*. In rodents was found in the UK by Healing, 1991, who noted that more than 10% of the animals were carrying

In conclusion, the prevalence of *Salmonella spp.* isolated from vectors differ from one study to another, how to harvest the samples and the interpretation methods (Skov et al., 2008).

In the UK, a total of 100 fecal samples, 50 and 25 rectal swabs collected from skin swabs rats (*Rattus norvegicus*) were examined for the presence of *Salmonella spp*. (Hilton et al., 2002).

The results showed the presence of *Salmonella spp*. in 8% of faecal samples analyzed, 10% in rectal swabs collected and the samples taken from the skin surface, they were negative for *Salmonella spp*..

Continuing analysis of fecal samples collected from pigs, as well as samples from the vectors (rodents, birds, insects) around farms studied by API 20E method most frequently isolated serovars were:

•from pigs and from rats/mice, isolated *S.* Typhimurium, *S.* Choleraesuis;

•samples from birds and insects isolated *S.* Typhimurium, and *S.* Derby was isolated only in fecal samples collected from pigs.

Similar study was conducted and by Skov et al., 2008, where the authors isolated in samples from swine herds *S.* Typhimurium, *S.* Newport, *S.* Derby, and samples from vectors, the same authors have isolated *S.* Typhimurium.

Andres-Barranco et al., 2014, was found a correlation between serovars isolated from pig farms and those who had access to the birds, the most common serovar isolated from both the birds and the pigs were *S.* Typhimurium.

In the study conducted by Somyanontanagul, 2009, the most common serovar isolated from samples collected from rodents was *S.* Typhimurium.

Prevention of carrier state, the farm must start by analyzing the input portion (vectors) that are carriers of a variety of *Salmonella* serovars that they can enter the actual source of contamination constitutes pigs (Blaha, 2000) and subsequently finished products.

CONCLUSIONS

Analyzing samples in farms studied, the vector potential carriers of positive samples were identified in all three vectors analyzed (wild, rats/mice, insects).

Highest prevalence was observed in rats (30%), and the reduced found in insects (20%). Analyzing the feces of fattening pigs from farms studied, resulting in contamination with *Salmonella spp*. 40% of pigs analyzed.

The most common serovar *S*. typhimurium was isolated, which was identified in both samples of the pigs, as well as in samples of vectors. In addition to this serovar and other serovars were isolated as *S*. Choleraesuis and S. Derby.

Contamination with *S*. Derby was isolated only in faeces from pigs, which argues that the possible causes of contamination with *Salmonella spp*. during the fattening pigs are not due only to the presence of vectors but also other possible causes such as lack sanitation, contaminated feed, the presence of carrier pigs.

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