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Use of serology as a tool for control programs of *Salmonella* sp. in pork production chain

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Introduction

Brazil had regulamented in 2018 a self-control program with official verification of *Salmonella* sp. in pig carcasses for slaughterhouses submitted to Federal Inspection Service. This proposal was recently presented to the sector and will stimulate the agroindustry's to develop systemic strategies for the control and monitoring of *Salmonella* sp., which at some point should also be directed to pre-harvesting stage. In this context, the serology may help the production system to predict the risk of entry and dissemination of *Salmonella* sp. in slaughter environment, as well to evaluate control measures in the field and the herd sanitary evolution. The objective of this research was to determine the correlation between serology, by seroprevalence and optical density values, with pigs shedding *Salmonella* sp. in faeces at the slaughter.

Material and Methods

The experiment was carried out on 20 growth and fattening pig farms, belonging to the same agroindustry integration system, with approximately 500 animals each. The pig herds were selected based on the following standard:

- 1- based on historical data of persistent infection by *Salmonella* sp.;
- 2- according to the housing program for piglets in the agroindustry.

Blood was collected from 30 animals by farm on the housing day. At the slaughterhouse, blood and portions of the ascending colon of were taken from 30 and 20 animals respectively. Serological analysis was performed using a commercial-ELISA (Herd Check Swine *Salmonella*® IDEXX Laboratories, ME, USA). The faeces were submitted to the isolation protocol of *Salmonella* sp. (ISO 6579: 2002). All statistical analyzes were performed using commercial software SAS®9.3: 2012. The association between the isolation of *Salmonella* sp. in the faeces with seroprevalence and with the intensity of the serological reaction measured by the optical density variability (% OD), through logistic regression.

Results

Considering 1200 blood serum collected, and a cut-off point of 20% OD, the seroprevalence at the time of housing ranged from 15 to 22%, and at slaughter rose to 75-80% in all batches, while optical density, in%, ranged from 10 to 22% to 75 to 95%. A total of 113 pigs (28,32%; IC 95%) were shedders *Salmonella* sp. in the faeces.

The correlation between the prevalence of pigs shedding *Salmonella* sp. in feces with the seroprevalence and optical density values was positive and significant ($p \leq 0.05$). For every 10 units of increase in seroprevalence (using a cut-off point of 40% OD), there was a 30.3% increment in the percentage of shedders (Figure 1), and for every increase of 10% in the % of OD value (Figure 2), was estimated a 15.6% increment of pigs shedding *Salmonella* sp.

Discussion and Conclusions

The antibody research, performed using a commercial available indirect enzyme-linked immunosorbent assay -ELISA (Herd Check Swine *Salmonella*® IDEXX Laboratories, ME, USA), considering 20% of the cut-off, has a low seroprevalence in the housing, varying from 15 to 22%, and at the time of slaughter it increased to 75 and 80%, which confirms that at this stage of production occurs the spread of bacteria among the animals and, consequently, an amplification of the infection. Previous studies have also found that pigs are infected at some point during the fattening period (Berends et al., 1996; Beloeil et al., 2003; Kranker et al., 2003). As the growth and fattening period lasts on average 110 days, the animals have the opportunity to become infected and seroconvert increasing the seroprevalence in the final phase of production.

From this perspective, biosafety is an essential component in the control of *Salmonella*. External biosecurity reduces the probability of introduction in the herd, while internal biosecurity reduces the spread of infection between stages and batches of pigs. Different measures of biosafety be they internal or external, as well as control of other enteric pathogens, were associated with seroprevalence of the herd and their deficiency increased the prevalence of *Salmonella* in pig farms (Arguello et al., 2018).

For being an indicative of the spread of bacteria in the herd, serology has been used as an indicator of risk in the batch of animals for the introduction of bacteria in the slaughter environment. It enables discrimination between herds in a concise, quick and inexpensive way. Serologically positive individuals, per se do not represent risk, however, in this study a rise of 10% in the herd seroprevalence was

followed by an increase of 30% in the possibility of *Salmonella* sp. faeces excretion. In this way, the seroprevalence of the lot has a positive correlation with the excretion level in the faeces.

These data support the serology as a useful tool to discriminated pigs' batches in a *Salmonella* control program to be adopted by the agroindustry. Measures such slaughter logistics orientation according to% of seroprevalence, monitoring of sanitary herds evolution, standardisation of sanitary pyramids; checking of control programs already implemented and evaluations of specific strategies against *Salmonella* sp. at the pre-harvest level can be based in serology database.

References

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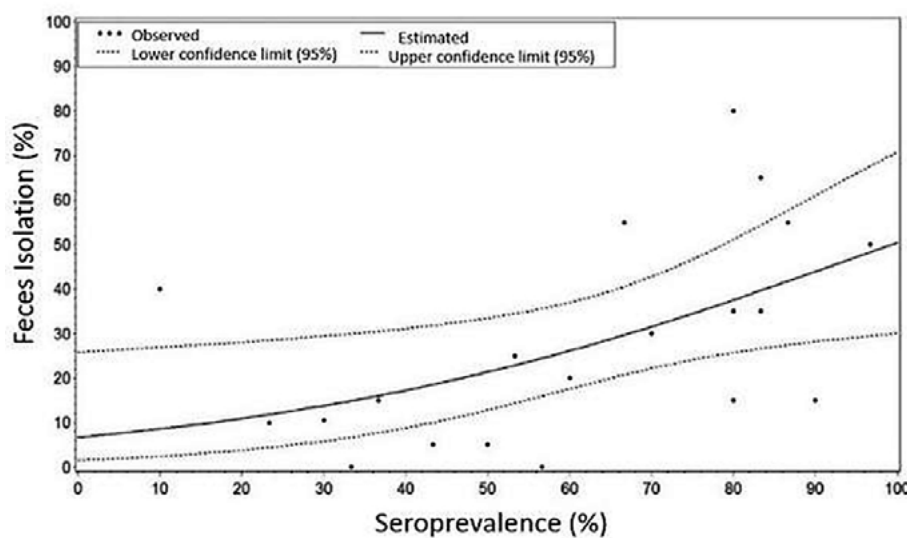


Figure 1: Percentage of isolation of *Salmonella* sp. in feces due to seroprevalence

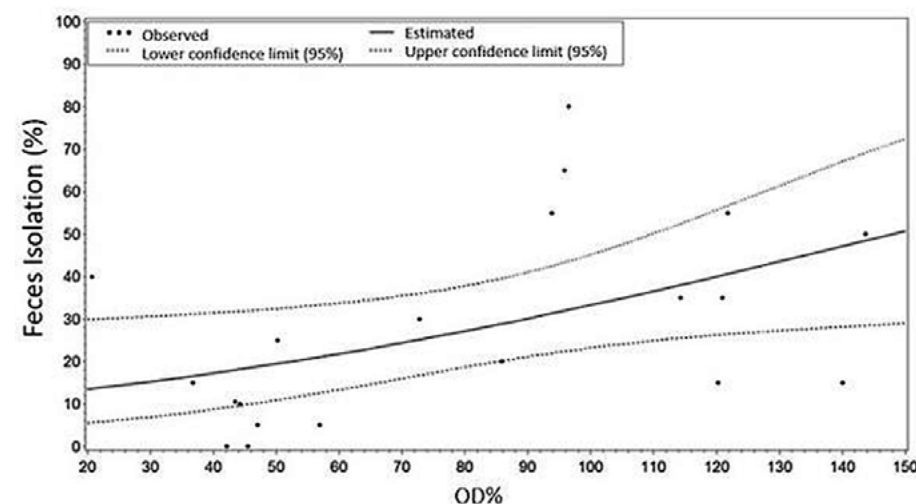


Figure 2: Percentage of isolation of *Salmonella* sp. in feces as a function of mean optical density