PIG CARCASSES SHOW IMPROVED HYGIENIC QUALITY FOLLOWING RISK-BASED INSPECTION

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BACKGROUND

Protecting consumer health is the primary objective of sanitary inspection for food of animal origin. In Brazil, the Industrial and Sanitary Inspection Regulation of Animal Products was first enacted in 1952 by the Ministry of Agriculture, Livestock and Food Supply (MAPA). Since that time, pig production has undergone marked expansion and modernization, accompanied by shifts in the zoonotic disease profile and the emergence of new hazards. These changes have revealed limitations in traditional inspection methods and heightened the risk of cross-contamination between carcasses and viscera.

In line with a global trend, risk-based inspection systems have gained prominence as a means of maintaining the official service's focus on public health, while assigning the food industry greater responsibility for ensuring product quality attributes. This approach, formalized for Brazilian pig slaughterhouses through Normative Instruction No. 79/2018, aims to align inspection practices with current epidemiological realities and food safety priorities.

To assess the hygienic performance of this new system, the present study compares the microbiological profiles of pig carcasses inspected under the traditional and the risk-based models in a slaughterhouse located in southern Brazil.

MATERIALS AND METHODS

This study was conducted at a pig slaughterhouse located in the western region of Paraná State, Brazil. The facility transitioned to a risk-based inspection system on January 9, 2024, in accordance with Normative Instruction No. 79/2018 issued by the Brazilian Ministry of Agriculture, Livestock, and Food Supply (MAPA).

Microbiological data were collected during the years 2023 and 2024, focusing on *Enterobacteriaceae* counts and the presence of *Salmonella* on swine carcasses. Sampling and analytical procedures followed the guidelines established in Normative Instruction No. 60/2018. A total of 485 samples were analyzed for *Enterobacteriaceae* and 535 samples for *Salmonella* detection.

The inspection system applied to each sample was determined by the collection date: samples obtained prior to January 9, 2024, were classified under the traditional inspection system, while those collected on or after that date were classified under the risk-based inspection system.

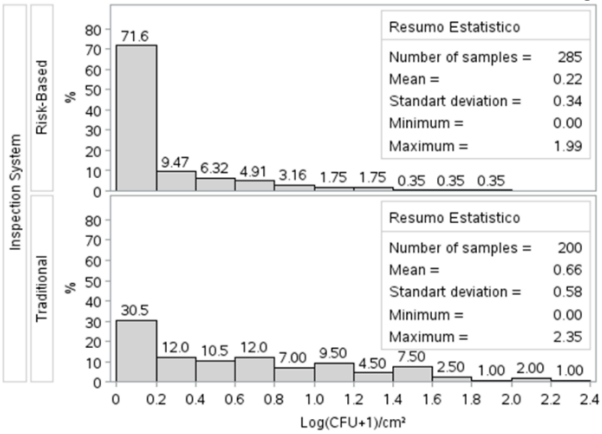
To compare *Enterobacteriaceae* counts between the two inspection models, data were $\log_{10}$-transformed and analyzed using the non-parametric Kruskal–Wallis test. The presence of *Salmonella* was evaluated using the chi-square (χ^2) test. All statistical analyses were performed using the NPAR1WAY and FREQ procedures in SAS software (SAS Institute Inc., 2012).

RESULTS

The Kruskal–Wallis test revealed a highly significant effect of the inspection system on *Enterobacteriaceae* counts in pig carcasses ($p < 0.0001$). The risk-based inspection was associated with an average reduction of nearly 0.5 log units—equivalent to approximately one-third of the count observed under the traditional system (Table 1). Notably, 71.6% of carcasses inspected under the

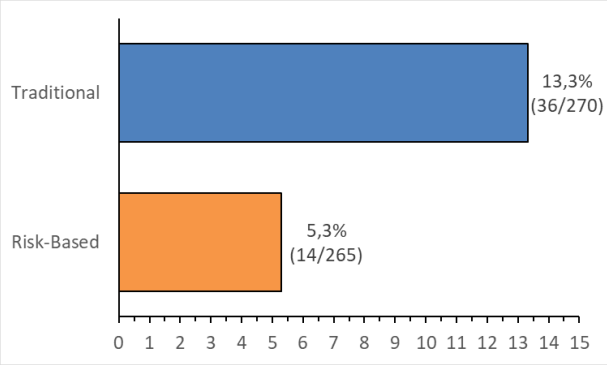
risk-based system presented counts below 0.2 log units/cm² (≈ 0.59 CFU/cm²), compared with only 30.5% of carcasses under the traditional inspection regime.

Table 1: *Enterobacteriaceae* counts according to the inspection system applied



Similarly, the χ^2 test indicated that the risk-based inspection system significantly reduced the detection of *Salmonella* in carcasses compared with the traditional approach ($p = 0.0014$) (Table 2).

Table 2. Proportion of samples testing positive for *Salmonella* according to the inspection system applied.



DISCUSSION and CONCLUSION

Transitioning from a traditional to a risk-based inspection system was associated with a measurable reduction in both *Enterobacteriaceae* counts and the prevalence of *Salmonella* in the studied facility. These improvements are likely linked to operational changes inherent to the risk-based model, including reduced carcass handling, minimized exposure of potentially contaminated tissues through complete head removal, and elimination of incisions into carcass and cranial lymph nodes. Collectively, these measures contribute to enhanced hygienic outcomes and support the role of risk-based inspection as an effective strategy for strengthening consumer health protection.

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