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PROCEEDINGS

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Simulation of intervention models for the control of Salmonella sp.

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Introduction

Given that the evaluation of risk factors is a recognized tool in the disease control programs, we suggest in this work the simulation of intervention models by identifying a set of risk variables. This tool implements control programs targeting the proposals for intervention on farms with use of mathematical models and thus optimizing resources and time for the evaluation of the intervention proposal.1,2 The objective of this study was to demonstrate the efficacy of a mathematical model as an aid in selecting intervention methods that decrease Salmonella seroprevalence at the slaughterhouse.

Materials and Methods

A questionnaire was conducted with 5 different companies on 189 Brazilian farms in different regions to identify risk factors of infection from Salmonella sp. These variables were used by the intervention simulation model. The seroprevalence of Salmonella at the abattoir is the dependent variable. The responses to the questionnaire are the independent variables. The association of the results was analyzed by logistic regression to identify risk factors in each integrator company. The estimated parameters were used to conduct three simulations; 1) represents the best combination of variables (values or protective conditions for the infection), 2) represents the worst combination (values or risk conditions for the infection) and 3) used the mode for each company (real field situation observed in this study). Salmonella prevalence was evaluated from seroprevalence at the slaughterhouse using the LPS ELISA.

Results

The mathematical simulation model calculated the seroprevalence of Salmonella at the slaughterhouse depending on the input of the level of risk factors (Chart 1). The level of risk was determined from the qualitative and quantitative values derived from the questionnaires. Simulation 1 demonstrates the lowest seroprevalence values which were obtained when risk factors were given the lowest scores, the least risk of transmission. Simulation 2 demonstrates the worst risk factors that contribute to the highest seroprevalence. Simulation 3 was included to simulate a closer representation of the most frequent risk factors and uses the mode values.3 The concept of combinatorial analysis is also used in addition to mode values to simulate different conditions of risk and protection.4

Chart 1. Salmonella seroprevalence (%) of 5 companies comparing the 3 simulation models.
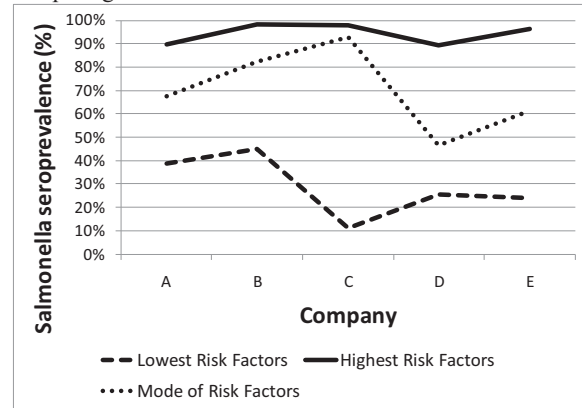
Discussion

Similar models are being used to evaluate the transmission of Salmonella sp. in grow/finish herds and from farrow to finish.5,6,7 This study demonstrates a trend that correlates high risk factors with high Salmonella seroprevalence at the slaughterhouse. This tool, still fairly new to this purpose, needs to be further evaluated and compared with assessments of intervention in the field in order to validate the proposed methodology.

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