RISK FACTORS FOR THE PREVALENCE OF SALMONELLA IN BELGIAN SLAUGHTER PIGS

Nollet N1,2., Maes D2., Duchateau L3., Huysmans K4., Geers R4., de Kruif A2., De Zutter L1., Van Hoof J1.

1 Department of Veterinary Public Health, 2 Department of Reproduction, Obstetrics and Herd Health; 3 Department of Physiology, Biochemistry and Biometrics, Faculty of Veterinary Medicine, Ghent University, Salisburylaan 133, 9820 Merelbeke, Belgium; 4 Laboratory for Quality Care in Animal Production, Zootechnical Centre, KULeuven

Corresponding author: Nollet Nathalie, phone: (+) 32 9 264.75.49, fax: (+) 32 9 264.75.34, email: nathalie.nollet@Ugent.be

Summary: Risk factors for Salmonellosis in pigs were investigated in a cross-sectional study on 62 Belgian farrow-to-finish herds belonging to one slaughterhouse co-operation. Herd data were collected using a questionnaire. The outcome variable, the percentage of positive animals per slaughterhouse delivery, was determined by qualitative Salmonella isolation from the mesenterial lymph nodes. Variables significantly related to the Salmonella prevalence in the univariate analyses were subsequently analysed in a multivariate model. Furthermore, the clustering of Salmonella infection within the pen was studied. The median percentage of positive samples per delivery was 64.5%. In the multivariate model, only type of floor significantly influenced the prevalence independently (p<0.05) with a fully slatted floor leading to the lowest Salmonella prevalence. Clustering between pigs from the same pen could not be demonstrated. The risk factors investigated here could only explain a small amount of the variability between herds.

Keywords: bacteriology, mesenterial lymph nodes, between-herd variability, clustering

Introduction: For reasons of food safety and economic pressure, risk factor studies are required to have a scientific basis to initiate a control programme for Salmonella in pig herds in Belgium. The aim of the present study was to determine risk factors for the prevalence of Salmonella carriers in Belgian slaughter pigs. This study was based on bacteriological isolation in mesenterial lymph nodes and differs from other risk factor studies in origin of sample (van der Wolf et al., 1999; Lo Fo Wong et al., 2002). Because the animals were individually identified, possible clustering of Salmonella infections between pigs from the same pen was also investigated.

Materials and Methods: From each of the 62 farrow-to-finish herds, 30 randomly selected pigs from an average delivery of 95 pigs were sampled at slaughter. A questionnaire, consisting of 2 major parts, was used to collect the herd data. A general part concerned all pigs in the herd, a specific part concerned the slaughter pigs to be sampled. In both parts, following topics were included: housing and ventilation, management, hygiene and biosecurity and production parameters. The specific part additionally pertained to feeding, disease control and transport to the slaughterhouse. All study pigs were individually identified before transport to the slaughterhouse. After evisceration, the intestines were numbered. Mesenterial lymph nodes were collected from every study pig and transported to the laboratory for qualitative Salmonella isolation, using standard procedures.

A generalised mixed model with binomially distributed error term was fitted to the percentage of positive animals in a slaughterhouse delivery. In a first step, each of the factors obtained from the questionnaire were separately introduced in the model to assess whether any of these factors was univariate associated with the risk of Salmonella infection. Factors significantly related to the Salmonella prevalence (p<0.05) were analysed jointly in a multivariate generalised mixed model with herd as random effect. Correlation between pigs from the same pen was studied in a generalised mixed model with binomially distributed error term and introducing pen as random effect and herd as fixed effect (PROC NLMIXED SAS 8.02).
Results: In 57 (91.9%) herds, at least 1 sample was positive. The overall prevalence was 65.6% (range 0 – 100%). There was substantial and significant variation between the herds, with the variance being estimated as 7.74. Eighteen categorical variables were studied by univariate analysis, of which only 6 were significantly associated with Salmonella prevalence (p<0.05): region (p = 0.014), purchase of gilts (p = 0.011), presence of the cat in the stables (p = 0.011), type of floor in the finishing unit (p = 0.005), ventilation type in the nursery unit (p = 0.043) and slaughterhouse (p = 0.001). The first 4 variables were introduced in the multivariate model. Slaughterhouse was excluded for reasons of multicollinearity with region. Ventilation type in the nursery unit was excluded because of 7 missing values. Only type of floor influenced the Salmonella prevalence (p<0.05) with a fully slatted floor associated with the lowest Salmonella prevalence. These factors incorporated in the multivariate model could only reduce the variance between herds to 4.51. The variance of the pen effect was not significantly different from zero (0.11 ± 0.16), so no clustering between pigs from the same pen could be demonstrated.

Discussion: This study was based on Salmonella isolation in mesenterial lymph nodes collected at the slaughterhouse and differed from other risk factor studies in origin sample. The determination of the prevalence in mesenterial lymph nodes gives a good indication of the carrier state of Salmonella infected animals, which are important for contamination of carcasses (Swanenburg et al., 2001). Although Salmonella infections during transport cannot be excluded, it is not considered important in the present study, because of the short transport and lairage times in Belgium. The variability for within-herd prevalence between herds was found high. The factors incorporated in the multivariate model could only partly explain the variability between herds, other potential risk indicators should be investigated in further research. Fully slatted floors seemed to be associated with the lowest Salmonella prevalence, in comparison with partly slatted or solid floors. In pens with fully slatted floors, less contact with contaminated faeces is possible and re-infection cycles are less likely to occur (Davies et al., 1997).

In all study herds, nose to nose contact between pigs from neighbourhood pens was possible. When a Salmonella infection enters the house, it can easily spread through all pens what can explain that no clustering was found.

Conclusions: A fully slatted floor results in a lower Salmonella prevalence compared to partly slatted or solid floors. Other risk factors need to be investigated. No clustering between pigs from the same pen was found.

Acknowledgements: The project was supported by the Federal Office of Public Health, Food Safety and Environment (grant S-6009-SRI), the K.U.Leuven (OT/00/21) and the IWT (K. Huysmans).

References: