Modelling as a tool to identify key measures to reduce Salmonella prevalence in slaughter pigs

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MODELLING AS A TOOL TO IDENTIFY KEY MEASURES TO REDUCE *SALMONELLA* PREVALENCE IN SLAUGHTER PIGS

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• Introduction

Since the control *of Salmonella* carriage is a major public concern, a new European regulation dealing with zoonosis aimed at reducing *Salmonella* in the pork food chain is required. At the herd level, several control measures are available to reduce the seroprevalence (Farzan *et al.*, 2006, Roesler *et al.*, 2006). Additional potential measures can be derived from what is used in other species, for instance vaccination. These control measures are characterized (i) by which mechanisms they modify, (ii) by which animals are targeted, (iii) during which period, and (iv) how efficiently they act. The aim of this study was to demonstrate how a modelling approach can help to apply a measure in an optimal way.

Material and method

In this study, a stochastic mathematical model representing the farrow-to-finish herd dynamics (Lurette *et al.*, 2008) as well as the *Salmonella* spread was used. We tested three reduction levels for two parameters that are assumed to be affected by the potential control measures: the infection probability and the *Salmonella* quantity shed. The measures were applied either to sows or pigs during their whole lifetime, or only to lactating sows, post-weaning pigs and finishing pigs. The assessment criterion used to compare the effect of the measures implemented was the percentage of groups of delivered pigs with a seroprevalence lower than 5% ($p_{5\%}$).

Results

Scenarios which led to more than 50% of groups of delivered pigs with a low seroprevalence differed according to the parameter considered, its level of reduction and the animals targeted. Indeed, reducing the infection probability by 50% for all pigs induced a $p_{5\%}$ higher than 50%. This value was only obtained with a 90% reduction when applied to finishing pigs (Fig. 1). A $p_{5\%}$ higher than 50% was reached by reducing the quantity of *Salmonella* shed only when applied to all sows and for a reduction of at least 50% (Fig. 2).

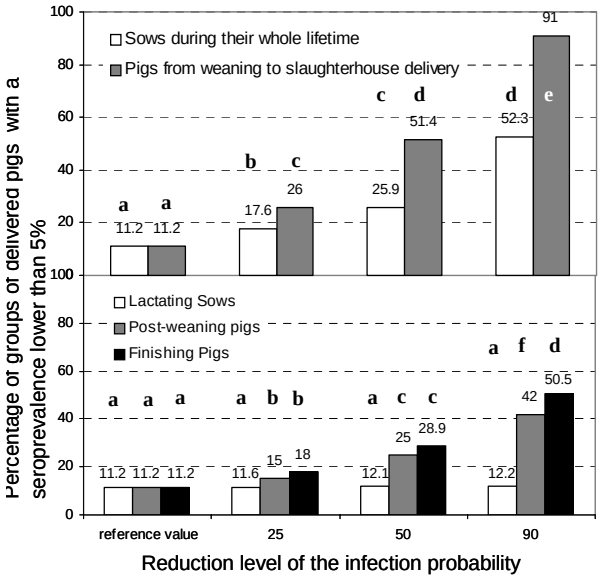

Figure 1 Percentage of groups of delivered pigs with *Salmonella* seroprevalence lower than 5% according to the level of reduction of the infection probability, the duration of the measure and the type of animal concerned. Values with the same letter are not significantly different

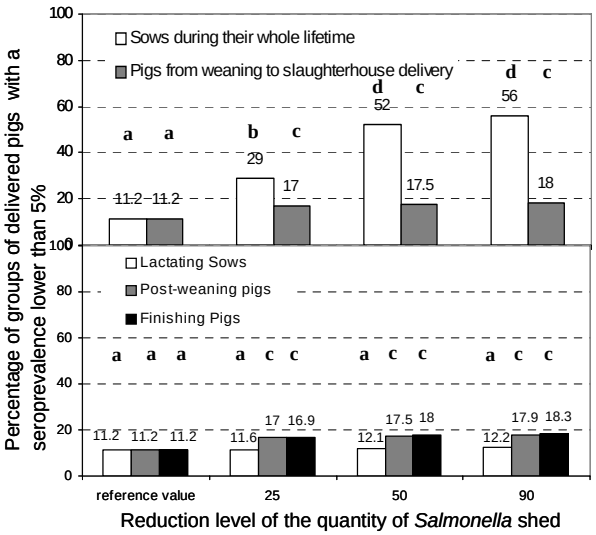

Figure 2 Percentage of groups of delivered pigs with *Salmonella* seroprevalence lower than 5% according to the level of reduction of the quantity of *Salmonella* shed, the duration of the measure and the type of animal concerned. Values with the same letter are not significantly different

Discussion

These results show that a modelling approach is a helpful tool to define the key features of potential *Salmonella* control measures at the herd level: which animals need to be targeted, during which period, and which efficiency the measure should reach to obtain a given *Salmonella* prevalence improvement.

Scenarios identified by the model results can be experimented to assess which level of parameter reduction can be reached by a measure implementation. Moreover, experimentations have shown that measures act on several mechanisms at once (for example vaccination). These measures could be therefore assessed with the model by testing the combined effect of several parameter reductions.

References

Farzan, A., et al.(2006) *Prev. Vet. Med.*, 73(4), 241-254. Lurette, A. et al (2008) *Animal*, 2(1), 105-116. Roesler, U., et al (2006) *J. Vet. Med.*, 53(5), 224-228.