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

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INTRODUCTION

The control of *Salmonella* in pigs is a major public health concern.

The objective of this study was to demonstrate how the modelling approach developed allows to determine better ways of applying control measures: animals targeted, periods of application and the measure of efficiency required; in order to significantly reduce the *Salmonella* prevalence in pigs.

MATERIALS & METHODS

A stochastic mathematical model representing both the pig and sow populations within a farrow-to-finish herd and the *Salmonella* spread was used (Lurette *et al.*, 2008) (Fig. 1).

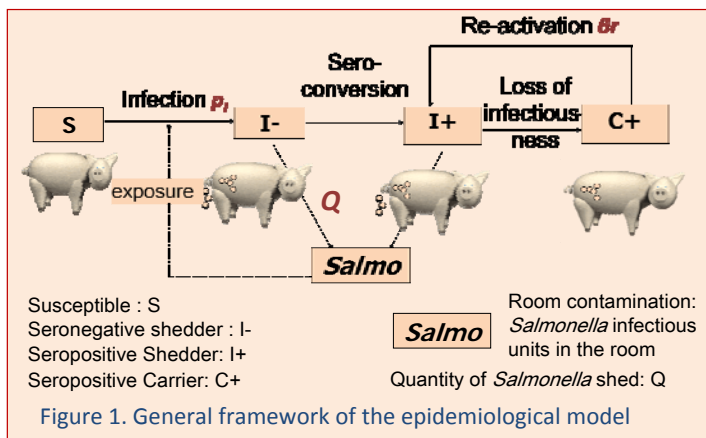


Figure 1. General framework of the epidemiological model

Measures to test :

- Optimize the implementation of existing measures → acidified food Farzan *et al.*, 2006
- Identify new potential measures and their implementation → vaccination Roesler *et al.*, 2006

Representation in the model :

- Hypothesis on implied mechanisms → effect on three epidemiological parameters: infection probability (p_i), quantity shed (Q) and re-activation probability (β_r) → 3 reduction levels (25, 50 & 90%) from their default value.
- Selection of animals and duration → 2 types of measure
 - Measure 1) either on sows or pigs during their lifetime
 - Measure 2) on lactating sows, on post-weaning or on finishing pigs

RESULTS

Reduction %	Reference	Infection probability p_i			Quantity shed Q		
		25	50	90	25	50	90
Measure 1)							
Sows	19.8	10.1	1.9	0.2	15.2	13.4	4.1
Pigs	19.8	16	13.1	7.7	19.5	16.8	10.8
Measure 2)							
Lactating sows	19.8	19.8	19.6	18.7	17.2	15.4	7.1
Finishing pigs	19.8	15.9	10.9	6.3	19.8	19.8	19.8

Table 1. Mean seroprevalence in groups of delivered pigs according to reduction in the probability of infection (p_i) or of the quantity shed (Q). Reference : default values for all parameters



Scenarios decreasing the mean seroprevalence differ according to the parameter considered, its level of reduction and the animal targeted (Tab. 1 & Fig. 2). A mean seroprevalence in groups of delivered pigs equal or less to 5% can be obtained by:

- Reducing the quantity of bacteria shed by the sows by 90%,
- Reducing both the probability of infection and the quantity shed by 25% and 50% respectively.

Moreover, when also combined with a reduction of the reactivation probability, the scenario can lead to a mean seroprevalence under 1%.

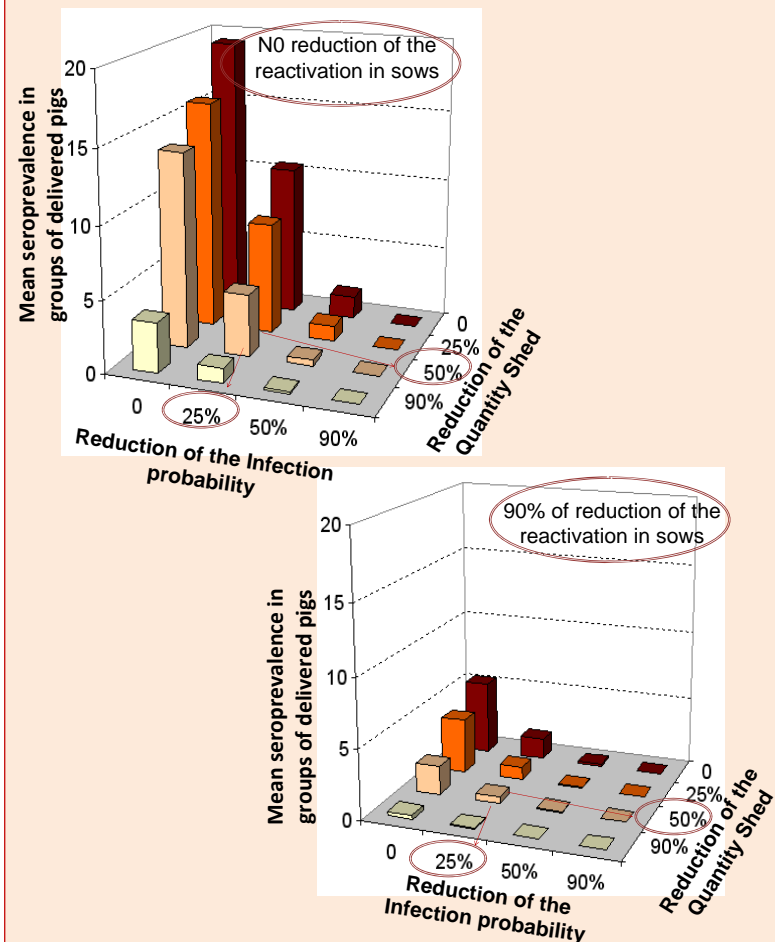


Figure 2. Mean seroprevalence in groups of delivered pigs according to the reduction in the probability of infection (p_i), the quantity shed (Q) and the reactivation probability (β_r).

DISCUSSION

Preliminary results that determine the required effect of a control measure on infection parameters. Further experimental studies are needed to confirm such effects are attainable. Moreover, our model allows to assess the effects of combinations of control measures.

Farzan *et al.*, (2006) Prev. Vet. Med, 73, 241-254
Lurette *et al.*, (2008) Vet. Res., 49, 39:01
Roesler *et al.*, (2006) J. Vet. Med. B., 53, 224-228