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

Amandine Lurette, Suzanne Touzeau, Pauline Ezanno, Thierry Hoch, Christine Fourichon, Henri H. Seegers, Catherine C. Belloc

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

A. Lurette[1], S.Touzeau[2], P. Ezanno[1], T. Hoch[1], C. Fourichon[1], H. Seegers[1], C. Belloc[1]

[1]INRA, ENVN, UMR1300 Bio-agression Epidémiologie et Analyse de Risque, BP 40706, F-44307 Nantes, France,

[2]INRA, UR341 Mathématiques et Informatique Appliquées, F-78350 Jouy-en-Josas, France

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).

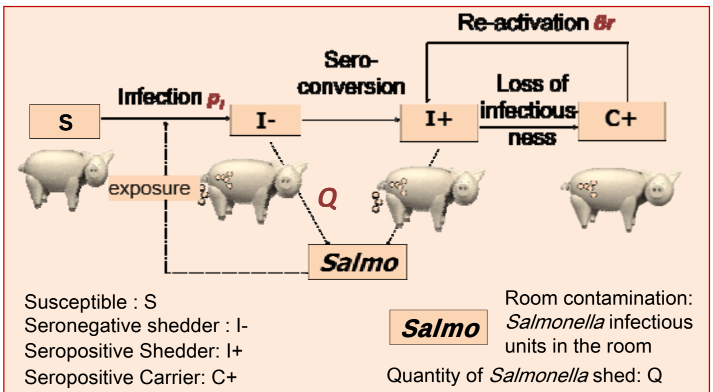

Figure 1. General framework of the epidemiological model

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 (pI), quantity shed (Q) and re-activation probability (βr) → 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 %		Infection probability p_I				Quantity shed Q		
Animal Targeted	Reference	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%**.

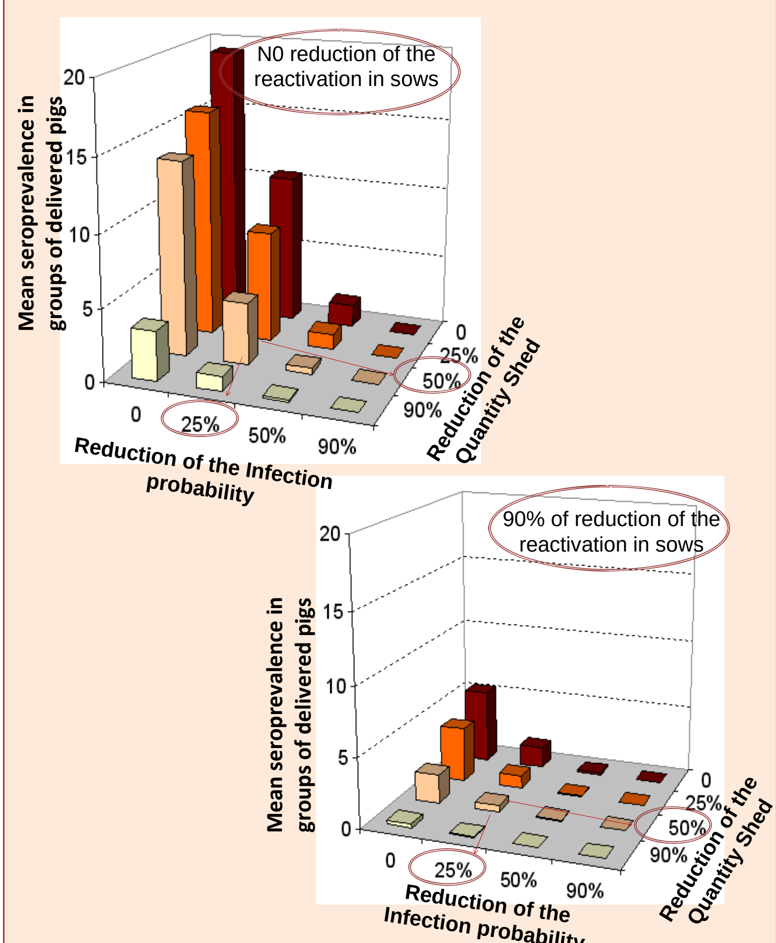

Figure 2. Mean seroprevalence in groups of delivered pigs according to the reduction in the probability of infection (p_I), the quantity shed (Q) and the reactivation probability (βr).

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