



# Study of the impact on *Salmonella* of moving outdoor pigs to fresh land in the United Kingdom.

Francesca Martelli <sup>1</sup>, Richard Smith <sup>2</sup>, Daniel Gilson <sup>2\*</sup> and Rob Davies <sup>1</sup>

<sup>1</sup> Department of Bacteriology, Animal and Plant Health Agency, Addlestone, Surrey, UK

<sup>2</sup> Department of Epidemiological Sciences, Animal and Plant Health Agency, Addlestone, Surrey, UK

## Background

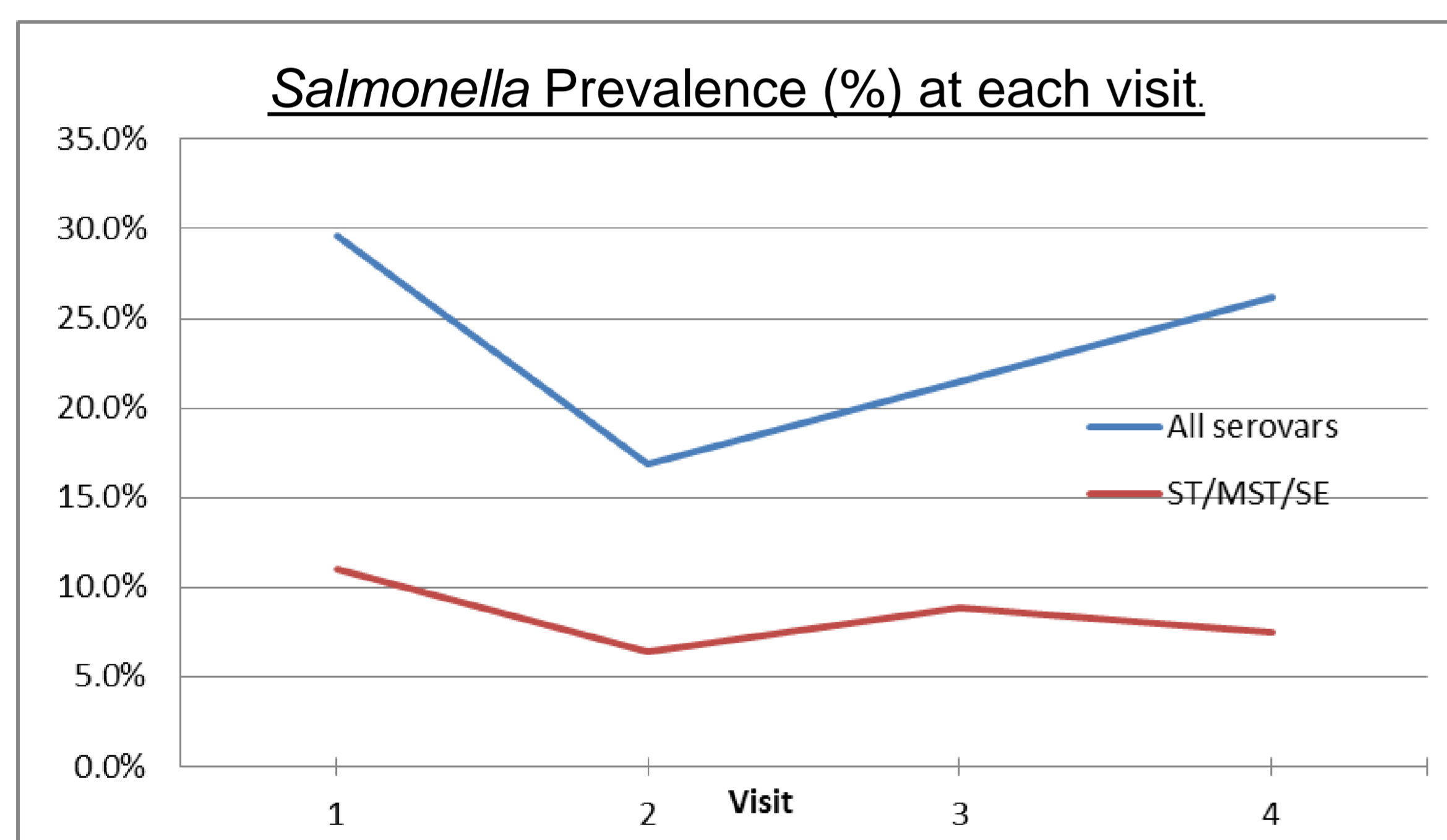
- In the United Kingdom approximately 40% of commercially-produced pigs are bred outdoors.
- Outdoor pig production has a tendency for high *Salmonella* prevalence at slaughter and a high frequency of environmental *Salmonella* contamination. Pigs may be at an increased risk of infection due to the lack of controlled environment that can be cleaned and disinfected between batches. Outdoor herds in the UK typically move site every 2-3 years.
- The aim of this study was to investigate the effect of moving outdoor pigs to new land on *Salmonella* prevalence



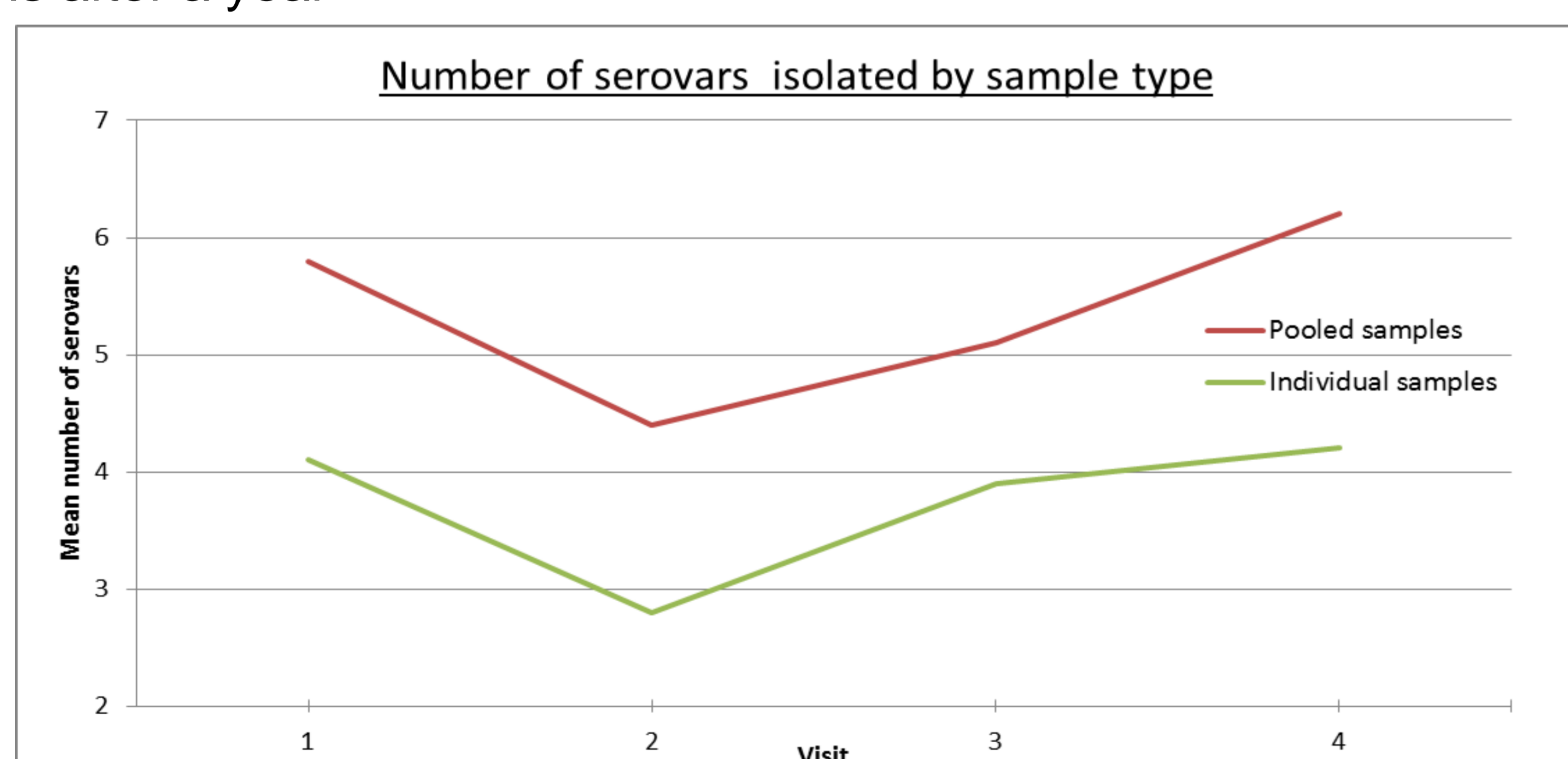
## Methods

- To aid detection of a change over time, where relevant data were available, farms were preferentially selected to the study if they had a *Salmonella* prevalence of over 20% and had S.Typhimurium (ST) and/or monophasic strains (MST) present in the pigs.
- Nine outdoor pig farms were visited four times over a 52 week period, and pooled and individual faecal samples and environmental samples (from wallows or wildlife faeces etc) were collected. The first visits covered sampling the pigs prior to a change of site followed by three visits, four months apart, to evaluate the change in prevalence and the distribution of *Salmonella*.
- Over 200 pooled and individual faecal samples were collected at each farm visit to estimate the prevalence in the different pig types on farm and identify the *Salmonella* serovars present
- *Salmonella* was isolated according to ISO6579 Annex D. Two outcomes were generated, whether a sample was positive for *Salmonella* and then whether it was positive for *Salmonella* of particular human health importance (ST, MST or S. Enteritidis (SE)).
- A mixed-effect model, accounting for farm clustering, was generated to assess the effect of visit number on *Salmonella* presence. *A priori* variables for sample type and seasonality (sinusoidal quarterly components) were included, and a forwards stepwise selection used to identify other differences between the farms, significantly associated with *Salmonella*, which needed to be accounted for.

## Results



There was a reduction in *Salmonella* prevalence after movement and it remained lower, on average, a year after the move. The number of unique serovars isolated per visit also reduced but returned to pre-movement levels after a year



Variable	Level	Odds Ratio	P-value	95% Conf. Interval
Visit	1 (Month 1)	1.00		
	2 (Month 4)	0.41	<0.001	0.34 0.51
	3 (Month 8)	0.74	0.03	0.57 0.96
	4 (Month 12)	1.18	0.08	0.98 1.42
Sampled area	Gestation	1.00		
	Farrowing	0.19	<0.001	0.16 0.23
	Weaners	0.48	<0.001	0.33 0.69
	Growers	0.49	<0.001	0.32 0.75
	Finishers	0.27	<0.001	0.20 0.36
	Gilts	0.65	0.03	0.44 0.96
	Maiden Gilts	0.44	0.25	0.11 1.80
	Dry Sows	0.31	<0.001	0.24 0.41
Environmental	1.12	0.78	0.50 2.49	
Sample type	Individual	1.00		
	Pooled	3.05	<0.001	2.71 3.44
Sinusoidal quarterly cycle	Sin	0.82	<0.001	0.73 0.92
	Cos	0.98	0.70	0.86 1.11
Coughing in sampled group	No	1.00		
	Yes	4.01	<0.001	2.78 5.78
Clinical Glasser's disease present	Yes	1.00		
	No	2.04	<0.001	1.68 2.48
Pig Accommodation	Arc	1.00		
	Hut	1.04	0.78	0.79 1.38
	Kennel	7.73	<0.001	2.45 24.43
	Lairage building	1.68	0.09	0.92 3.04
	Tent	3.82	<0.001	2.59 5.61

The table above presents the results of the final mixed-effect model. The model results indicated that samples from visits 2 and 3 were still significantly less likely to have *Salmonella* detected, whereas the final visit was not significantly different to visit 1, once the other variables had been accounted for. The model included four variables, added by the stepwise process. Of interest was the finding that samples from pigs were also less likely to have *Salmonella* detected than environmental samples, and that samples from kennels and tents were more likely to be positive compared to other accommodation types. There was some variability in results between the 9 farms, but 6 of the 9 farms still maintained a lower prevalence a year after the move.

## Conclusions

- The prevalence of *Salmonella* was lower following movement to a new site and while it increased throughout the year it remained on average lower at the end of the sampling period (a year later).
- The diversity of different serovars detected at each visit may suggest a wide variety of different sources of *Salmonella* on an outdoor farm.
- The findings provide important evidence that more frequent site moves may help reduce *Salmonella* prevalence in outdoor herds. However, this was a small trial of nine outdoors farm and so corroboration of the findings in other trials would be beneficial, as well as an investigation of any potential cumulative benefit if herds were followed over a series of annual moves.

