A comparison between the characteristics of a group of English pig farms with high *Salmonella* seroprevalence, and a randomly selected group

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1. Introduction

The British Pig Executive established the Zoonoses Action Plan (ZAP) *Salmonella* programme in June 2002 as an industry initiative supported by the FSA and Defra. All British pig farms using assured abattoirs are ranked according to the prevalence of meat-juice ELISA samples collected at abattoirs (currently ZAP 1 <65% positive; ZAP 2 65-85% positive; ZAP 3 >85% positive). Around 1% of farms are allocated a ZAP3 score. Farms in ZAP level 2 or 3 must act and return to ZAP level 1 or face suspension from Quality Assurance schemes. Controlling *Salmonella* is now a growing concern to UK pig farmers and their veterinary advisors. A range of options aimed at reducing levels of infection are available. These can include for example – increased biosecurity, improved hygiene measures, use of organic acids, and changing feed type. Management practices on a group of ZAP3 farms which regular monitoring has found to have high *Salmonella* antibody levels and thus a high ZAP score, were compared to a randomly selected group of farms felt to be representative of the UK pig population. The aim of the work was to identify management differences between the groups that may be associated with the likelihood that a farm becomes identified as ZAP3. Further studies which are currently underway are hoped to provide further clarification.

2. Materials & Methods

The Veterinary Laboratories Agency (VLA) supports ZAP by offering free advisory visits to farms in England which have high scores. The main aim of these visits is to make practical recommendations for the control of *Salmonella* based on culture of environmental and faecal samples, and assessment of risk factors. Management data are collected during these visits using a standardized form.

We compare this dataset with similar information collected from a group of 103 randomly selected units, which were part of a voluntary research project during 2003.

3. Results

Management factors affecting the farms are presented below, along with the results of bivariate statistical tests:

		High ZAP score farms	N	Randomly selected farms	N	Statistical test
Geographical Area	East of England	64.3%	18	42.7%	44	Chi2, P=0.104
	Yorkshire & Humberside	17.9%	5	35.9%	37	
	Others	17.9%	5	21.4%	22	
Total number of pig deliveries in preceding 12 months		7.7 mean	21	21.8 mean	91	Kruskal-Wallis, P= 0.1737
Total number of different pig sources in past 12 months		4.8 mean	22	2.7 mean	92	Kruskal-Wallis, P= 0.0440
Total number of pigs on the unit		1671 mean	27	2814 mean	88	Kruskal-Wallis, P= 0.0039
Unit is specialist finisher with no breeding animals		51.9%	27	47.5%	101	Chi2, P=0.689
Any growers or finishers kept on slatted flooring		42.9%	7	58.67%	75	Fisher's, P=0.453
Herd recording scheme used		74.1%	27	51.6%	93	Chi2, P=0.038
Unit has written biosecurity and hygiene plan		65.4%	26	83.7%	92	Chi2, P=0.041
Any farm equipment shared with other enterprises		21.4%	28	66.0%	94	Chi2, P<0.001
Any growers or finishers receive fermented or other liquid diet		0.0%	28	30.2%	86	Chi2, P=0.001
Any bulk feed bins not covered or sealed		3.7%	27	11.6%	95	Chi2, P=0.225
Mains drinking water supply		82.1%	28	67.4%	95	Chi2, P=0.131
Feed handling equipment not used exclusively for this purpose		7.1%	28	25.0%	92	Chi2, P=0.042
Footwear disinfection used		81.5%	27	88.4%	95	Chi2, P=0.346
Vehicle wheel disinfection used		11.1%	27	32.6%	95	Chi2, P=0.028
Dedicated sick pens used		92.9%	28	85.3%	95	Chi2, P=0.294
Recovered sick pigs mixed with mainstream animals		30.8%	26	40.4%	94	Chi2, P=0.370

- Written biosecurity were more often reported on the randomly selected farms. This may indicate that these are generally taken more seriously resulting in a lower probability of these farms becoming high ZAP score farms.

- Geography had no statistically significant affect, though this may be due to the small sample size, and affected by recruitment artefacts.

- Liquid feeding was not used by any of the high ZAP score farms visited, supporting previous evidence that this reduces the risk of *Salmonella* infection.

- Use of computerised herd record schemes was apparently associated with being a high ZAP score farm

- A lower number of sources; a smaller herd size; and vehicle wheel disinfection, were more likely to be found on the randomly selected farms.

- Use of dedicated feed moving equipment, and dedicated farm equipment in general, were more often found in the high ZAP score units.

4. Multivariate analysis

The variables were included in a multivariable logistic model, and the following four remained significant at p>0.05 (liquid feeding was excluded due to a paucity of data in the high ZAP score group):

	Odds ratio (adjusted)	95% confidence interval (adjusted)
Total number of different pig sources in past 12 months	2.02	1.25 - 3.25
Total number of pigs on the unit	0.39	0.21 - 0.72
Herd identification & recording scheme used	6.37	1.47 - 27.73
Any farm equipment shared with other enterprises	0.09	0.02 - 0.28

Use of wheel dips; using feed handling equipment for other tasks; and having a written biosecurity & hygiene plan, were no longer found to have an effect when controlling for other factors.

Sharing equipment with other farms still appears to be protective against being put into the high seroprevalence group. Although this reasons for this remain unclear it may could be as a results of extra cleaning when the equipment is returned.

5. *Salmonella* culture

There was no significant difference in *Salmonella* culture prevalence in pooled faecal samples collected from the farms on a single visit:

	High ZAP score farms	N	Randomly selected farms	N	
Salmonella culture prevalence	25.7% mean	28	23.1% mean	103	Kruskal-Wallis, P= 0.3940

The levels of *Salmonella* excreted on farms vary widely both between farms and temporally within farms. The pigs on high ZAP score farms are often sampled retrospectively to the allocation of a ZAP score and thus are not the same pigs as present when ZAP status is initially assigned. Also, while related, the two measures of *Salmonella* are not the same.

6. Conclusions

This analysis is based on a small amount of data gathered as part of visits providing support to farmers with high ZAP scores. This database continues to expand and it will be possible to compare it with more detailed management information collected during a more recent project concentrating on low ZAP score units.

This interim analysis provides further support for the use of liquid feeding to reduce *Salmonella* (this practice was absent in the high ZAP group), as well as minimising the number of sources supplying animals. A certain degree of bias means caution is required in interpreting this kind of questionnaire result, however we feel that this analysis demonstrates the utility of collecting this kind of management data during these visits.

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