Observations of the effect of "on-farm" interventions in relation to Salmonella infection.

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Summary: During a longitudinal study of Salmonella on pig farms in England conducted between 1997 and 2000 some of the participating farms introduced interventions to control Salmonella infection. Interventions such as, feed acidification and fermented liquid feed were not successful. The more successful interventions in terms of Salmonella control were in batch systems; dry cleaning accompanied by disinfection using 2% formaldehyde solution. In many cases the beneficial effects of the interventions were undermined by the introduction of pigs already carrying salmonellas, failure to disinfect walkways, ventilation systems and other farm equipment. The use of single interventions is unlikely to result in the control of Salmonella at the farm level.

Keywords: Disinfection, pigs, formaldehyde, acidified feed, fermented liquid feed.

Introduction: A longitudinal study looking at the distribution and prevalence of Salmonella on pig farms in England was conducted between 1997 and 2000. In the course of which it was possible to observe the effects of interventions intended to control salmonella. The intention was to generate data to support the intervention and demonstrate the benefits of good practice.

Materials and Methods: Isolation methods: Sampling for the longitudinal study involved collection of bulked faeces samples (~25g) from pens and a range of samples from the environment and wildlife. Samples were returned to the laboratory on the same day as collected and examined for Salmonella as per Davies and Wray, (1997.) Briefly; samples were pre-enriched in Buffered Peptone Water for 18 hours at 37 °C followed by selective enrichment in Diassalm medium at 41.5 °C. Subcultures were made onto Rambach agar after 24 and 48 hours and incubated at 37 °C for 18-24 hours. Suspect colonies were examined using polyvalent sera in a slide test and later confirmed by full serotyping, Shipp and Rowe (1980). Carriage of Salmonella in pigs at slaughter was assessed from samples of L.I. contents, Davies, et al (1999).

Feed acidification: For two months the rations for weaners and finishers were supplemented with formic acid. Bulked faeces were sampled from these areas. Fermented liquid feed: Piglets (4-11weeks) were fed dry rations or fermented liquid feed (FLF) ~pH 4.0. Rectal swabs were taken from both groups on 3 occasions during this time and posted to the laboratory. In total, three groups of piglets were examined.
Disinfection: The existing cleaning procedure for farrowing rooms and flat decks on 3 farms was assessed and compared to a new procedure introduced on Farm 3. Inter-batch disinfection of finishing pens and the carriage rate of pigs at slaughter was assessed over 3 production cycles on 5 farms. Three of these were batch finisher farms and used 2% formaldehyde, the others practised continuous production, one used sanitiser and peroxygen the other used sanitiser and QAC/aldehyde.

Results: Feed acidification: The proportion of Salmonella positive samples rose in both groups; in weaner areas, from 12/30 [40.0%] before treatment to 11/22 [50.0%] afterwards and for finisher areas from 6/28 [21.4%] before treatment to 13/28 [46.4%] afterwards.
Fermented liquid feed: Isolation rates of Salmonella were similar in both groups; 11/134 [8.2%] in the FLF group and 7/135 [5.2%] in the dry fed group.
Improved disinfection: The effectiveness of disinfection in farrowing rooms and flat decks is shown in table 1.

Table1. Isolation rates of Salmonella in farrowing rooms and flat decks.

		Level of Salm. on pen surfaces post C&D before study.	Cleaning and disinfection (C&D) system	Level Salm. in bulked faeces before C&D	Level Salm. pen surfaces post C&D
Farrowing rooms	Fm 1	5/24 [20.8%]	Sanitiser+peroxygen.	2/36 [5.5%]	1//60 [1.7%]
	Fm 2	0/40 [0]	Sanitiser+peroxygen.	6/19 [31.6%]	1/40 [2.5%]
	Fm 3	Not done	Sanitiser+quaternary ammonium/aldehyde.	0/32 [0]	1/80 [1.3%]
Flat decks	Fm 1	0/10 [0]	Sanitiser+peroxygen.	5/10 [50.0%]	1/36 [2.8%]
	Fm 2	0/10 [0]	Sanitiser+peroxygen.	7/24 [29.2%]	0/36 [0]
	Fm 3	3/10 [30.0%]	Sanitiser+quaternary ammonium/aldehyde.	16/20 [80.0%]	3/30[10.0%]

The effect of introducing inter-batch disinfection of finisher pens is shown in table 2.

Table 2.Isolation rates of salmonellas in finisher pens and pigs at slaughter.

	Farm A (batch) 2% Formaldehyde	Farm B (batch) 2% Formaldehyde	Farm C (batch) 2% Formaldehyde	Farm D Sanitiser + peroxygen.	Farm E Sanitiser + quaternary ammonium/ aldehyde.
Pens at end of production	28/91 [30.8%]	152/384 [39.5%]	43/150 [28.7%]	43/124 [34.6%]	36/58 [62.0%]
Pig carriage at slaughter (LI)	24/269 [8.9%]	17/203 [8.3%]	11/337 [4.4%]	15/161 [9.3%]	22/177 [12.4%]
Pens post C&D	8/190 [4.2%]	21/480 [4.4%]	0/117 [0]	20/80 [25.0%]	16/122 [13.1%]

Discussion: In this study the feeding of acidified feed or fermented wet feed did not have the desired effect of reducing the level of salmonella infection. This is in contrast to the findings of Dahl et al (1999). Reasonable levels of disinfection were obtained in farrowing rooms and flat decks with both products. However observed improvements may be attributable to greater operator awareness brought about by the study itself. It was felt that much of the benefit of disinfection was undermined through the continuous occupation of buildings on the breeder finisher farms and failure to disinfect walkways, as did the introduction of already infected replacement stock on the batch finisher farms. Single interventions are unlikely to succeed in controlling salmonellas on pig farms.

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References:

Dahl, J., Jorgensen, L., Wingstrand, A., 1999. An intervention study of the effect of implementing Salmonella controlling feeding strategies in Salmonella high prevalence herds. Proceedings of the 3rd International Symposium on Epidemiology and Control of Salmonella in Pork, 5-7 August, Washington, USA. p340-342.

Davies and Wray Distribution of Salmonella on 23 pig farms in the UK. Proceedings. of 2nd International symposium of Epidemiology and Control of Salmonella in Pork, Copenhagen. Aug 20-22 1997.

Davies R.H., Mclaren I.M., Bedford S. Observations on the distribution of Salmonella in a high throughput pig abbatoir. Vet Record, 1999, **145**: 655-661.

Shipp Christine R. and Rowe B. A mechanised microtechnique for Salmonella serotyping. Journal Clinical Pathology, 1980, **33** : 595-60.