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Direct and indirect transmission of four Salmonella enterica serotypes in pigs

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Introduction

The Salmonella serotypes commonly detected in raw feed materials in Sweden often differ from the serotypes most often isolated from animals and humans. Why only few of the "feed-associated" serotypes seem to reach or spread within the animal population has not been sufficiently investigated. In the present study we have performed comparative examinations of two serotypes commonly isolated from pigs (S Typhimurium and S Derby) and two "feed associated" seotypes (S Yoruba and S Cubana) by studying their ability to infect pigs in a direct and indirect transmission situation aiming to investigate possible differences among serotypes.

Materials and Methods

In total, 48 ten-weeks-old pigs, deriving from a Swedish nucleus herd, were split into eight groups. Each group was housed in a separate room in a pen with solid concrete floor. Sawdust bedding covered half of the pen and the dung was cleared out twice daily.

Direct contact transmission (DT) was studied by mixing six pigs with two seeder pigs, aged 18 weeks, in each of four cleaned and disinfected pens. The two seeder pigs in each group had a well documented history of long-term faecal excretion of one of the four selected serotypes of Salmonella, as they had been inoculated with 109 colony forming units (cfu) of the serotype 8 weeks earlier (1, 2).

Indirect transmission (IT) was studied in six pigs in each of four pens were Salmonella infected pigs had previously been housed. The infected pigs had been inoculated with 109 cfu of the serotype eight weeks earlier and their faecal excretion of Salmonella had been monitored for eight weeks before the naive pigs replaced them in the unwashed pens (1, 2).

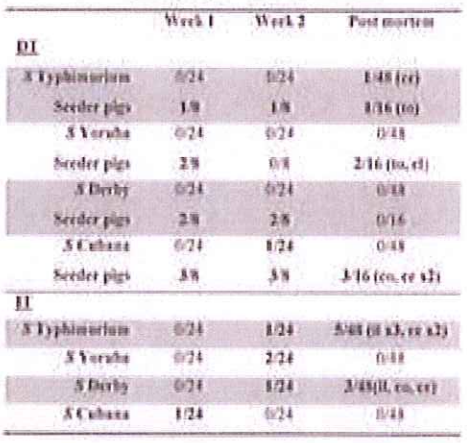
All pigs in the eight rooms were monitored for two weeks with respect to their faecal excretion of Salmonella and the presence of serum antibodies. In total, eight faecal samples and three serum samples were collected from each pig. In addition, eight tissue samples per pig were collected at necropsy.

Results

The results from culturing the faecal samples and the samples collected post mortem are shown in Figure 1.

All pigs remained serologically negative throughout the study, except four pigs in the two Yoruba-groups that expressed antibody levels just above the cut-off in the in-house ELISA constructed to detect antibodies to S Yoruba.

Figure 1. *Number of Salmonella positive faecal samples per week and post mortem samples from eight tissues; tonsil (to), liver (li), spleen (sp), colon wall (cw), three lymph nodes: mandibular (ml), ileocecal (il) and colonic (cl), and cecum content (cc). DT=direct transmission trial, IT=indirect transmission trial.*



	Week 1	Week 2	Post mortem
DT			
S Typhimurium	0/24	0/24	1/48 (cc)
Seeder pigs	1/8	1/8	1/16 (to)
S Yoruba	0/24	0/24	0/48
Seeder pigs	2/8	0/8	2/16 (to, cl)
S Derby	0/24	0/24	0/48
Seeder pigs	2/8	2/8	0/16
S Cubana	0/24	1/24	0/48
Seeder pigs	3/8	3/8	3/16 (cw, cc x2)
IT			
S Typhimurium	0/24	1/24	5/48 (il x3, cc x2)
S Yoruba	0/24	2/24	0/48
S Derby	0/24	1/24	2/48(il, cw, cc)
S Cubana	1/24	0/24	0/48

Discussion and Conclusions

The rate of transmission was apparently low in both the direct and the indirect transmission situation, and no differences between the four serotypes could be concluded with respect to the faecal shedding of Salmonella. In contrast, a difference between serotypes was indicated by the results from the IT post mortem samples, as S Typhimurium was re-isolated from four pigs housed in the contaminated environment.

In conclusion, the overall low level of transmission of all four serotypes in both trials most probably reflected a low dose exposure. Pigs shedding Salmonella at detectable but low levels may not necessarily transmit the pathogen to its pen mates, not even in a solid floor environment. This high-lights the importance of hygienic measures, in order to keep the shedding and re-circulation of Salmonella spp. low in infected herds. However, isolation of S Typhiurium from especially the ileocecal lymph nodes can be expected even in herds with a very low load of S Typhimurium.

References

1. Österberg & Wallgren (2008) Vet Rec 162: 580-586.
2. Österberg et al (2009) Vet Rec 165: 404-408.