SALMONELLA ENTERICA CONTAMINATION OF PIG SLURRY : A FIELD STUDY

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Introduction

In industrialised countries, *Salmonella enterica* is a frequent cause of food borne disease. About 15-25 % of all human cases of salmonellosis can be attributed to the consumption of contaminated pork and pork products (2, 3). Contamination of pork products is related to asymptomatic intestinal carriage of *Salmonella* by living pigs arriving at the slaughterhouse (4). In order to reduce the occurrence of *Salmonella* in pork, a decrease of *Salmonella* carriage at the farm level is needed. On the other hand, the spread of *S.* contaminated slurry on fields and crops may constitute a threat on an environmental point of view. Therefore, efforts undertaken at the farm level to reduce *Salmonella* shedding contribute to increase both human food safety and environmental safety. Few data are available regarding the contamination level of finishing pigs and their slurry in France. The aim of our study was to identify *Salmonella* contaminated finishing pig batches and to assess the level of contamination of their slurry.

Material and Methods

Our study was carried out from April 2003 to January 2004. 39 batches of finishing pigs from 27 farrow-to-finish French farms suspected to be positive to *Salmonella enterica* were involved in the survey. *Salmonella* shedding was assessed on the one hand with an environmental sampling procedure: sterile pairs of gauze socks (Sodibox, La Forêt Fouesnant, France) were used to wipe faecal material on the slatted floor of each pen housing the targeted batch of pigs. On the other hand, in each pen a pool of newly excreted faeces was collected on the floor and placed into sterile bags. In addition 4 litres of slurry stored in the pit below the followed pigs were collected in sterile bottles. Environmental swabs, pools of faecal matter and slurry were analysed for the presence of *Salmonella enterica* in a four stages protocol. Following a pre-enrichment step (20 hours at 37 °C in buffered peptonned water), two selective media were used : Müller - Kauffman Tetrathionate Broth (MKTB) and Modified Semi-Solid Rappaport Vassiliadis agar (MSRV), incubated respectively 24 hours at 42°C and 48 hours at 41,5°C. The migrated colonies of MSRV were isolated on Rambach agar plates and each MKTB on Xylose-Lysine-Tergitol4 (XLT4) agar plates. Both media were incubated 24 hours at 37 °C. The presumptive colonies were biochemically confirmed on Kligler-Hajna medium (AES Laboratoires, Combourg, France). All isolates were serotyped by agglutination following the Kauffman-White scheme (1). On positive pools of faecal material and positive samples of slurry, a quantification of *Salmonella* was assessed according to the most probable number method (MPN calculator VB6, 5).

Results

At least one swab sample tested positive in the environment of 13 batches (33.3 %). In 8 batches, *Salmonella* shedding was also detected in pooled faeces. *Salmonella* quantification was possible in 4 of the latter samples in which levels of 2.4 to 350 *Salmonella*/gram were detected. In 6 batches, *Salmonella* was identified in slurry samples. Quantification was achieved in only one sample of slurry and we found 1.6 *Salmonella*/ml. Quantification in pooled faeces or in slurry was only possible when at least 50 % of environmental swabs tested *Salmonella* positive. *Salmonella Typhimurium* and *Salmonella Derby* were the most common serotypes isolated. The results concerning the positive samples are presented table 1.

Table 1 : Description of *Salmonella* serotypes isolated in swabs, pooled faeces and slurry samples and *Salmonella* quantification in pooled faeces and slurry (15 positive batches, April 2003 - January 2004)

Batch	% Positive swabs and serotype	*Salmonella* serotype detected in pool faecal matter	mpn in pool fecal matter (S./gram and CI at 95 %)	*Salmonella* serotype detected in slurry samples	mpn in slurry samples (S./mL and CI at 95 %)
1	**100** ***S.T***	*S.T*	2,4 (0,66-8,5)	*S.T*	-
2	12.5 *S.T*	-	-	*S.T*	-
3	**75.0** ***S.T***	*S.T*	8,3 (2,7-25)	*S.T*	-
4	**50.0** ***S.T***	*S.T*	350 (94-1300)	*S.T*	-
5	40.0 *S.T*	*S.T*	-	-	-
6	12.5 *S.T*	-	-	-	-
7	25 *S.*Bredeney	*S. Bredeney*	-	-	-
8	**55.6** ***S. Derby***	*S. Derby*	350 (94-1300)	*S. Derby*	1,6 (0,38-6,9)
9	8.3 *S. Derby*	*S. Derby*	-	-	-
10	0.0	*S. Derby*	-	-	-
11	16.7 *S. Derby*	-	-	-	-
12	14.3 *S. Derby*	-	-	-	-
13	8.3 *S.T*	-	-	-	-
14	0.0	-	-	*S. Derby*	-
15	8.3 *S. Derby*	-	-	-	-

S.T : S.Typhimurium

Discussion

Our study indicates that pig slurry may be contaminated by *Salmonella enterica*. However, the results suggest that *Salmonella* can only be detected in slurry of highly shedding batches of pigs.

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References

1- Popoff M. Y. and Le Minor L., 1992. Antigenic formulas of the *Salmonella* serovars. Paris, Institut Pasteur. 8 p.
2 - Van Pelt, W. and Valkenburgh, S.M., 2001. Zoonoses and zoonotic agents in humans, food, animals and feed in the Netherlands.
3 - Hald T. *et al.*, 1999. 3rd International Symposium of the Epidemiology and Control of *Salmonella* in Pork, Washington DC, USA. 197-199.
4 - Borch E. *et al.*, 1996. Int. J. of Food Microbiol. 30 : 9-25.
5 - http ://members.yne.net/mcuriale/mpn