Bacteriological prevalence in finishing pig farms assigned as *Salmonella* risk farms by serological screening

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Abstract

The Belgian Federal Agency for the Safety of the Food Chain (FASFC) installed a National *Salmonella* surveillance and control program in pigs, the *Salmonella* Action Plan (SAP), which became compulsory by means of a Royal act in July 2007. Assignment as Salmonella risk farm is based on serological analysis of blood samples collected from the fattening pigs. The knowledge of prevailing serovars of *Salmonella* by bacteriological methods is essential to develop and/or evaluate the serological method. In 57% of all the assigned farms, based on serological screening (= mean S/P-ratio's), there is 'firm evidence' by bacteriological isolation. This suggests that a sufficient correlation is achieved at herd level in the first stage of the *Salmonella* Action Plan.

Introduction

Salmonella is considered as one of the most important food borne pathogens that has potential implications for human health (Mao et al.,2003). The EU Zoonoses Regulation Nr 2160/2003 requires Member States to take effective measures to detect and control *Salmonella's* of public health significance. To control *Salmonella* at the pre-harvest stage the implementation of a surveillance and control programs is established in the different Member States. Although the Commission provides directives, it is likely that National control programs will vary to some extent between the Member States. Since 2005, the Belgian Federal Agency for the Safety of the Food Chain (FASFC) installed a National *Salmonella* surveillance and control program in pigs, the *Salmonella* Action Plan (SAP), which became compulsory by means of a Royal Act in July 2007 (Anonymous, 2007). As in most European countries, the monitoring and surveillance program for swine Salmonellosis is based on serological techniques. Once pig farms are identified as risk farms, they need to develop a herd-specific *Salmonella* action plan in order to improve their status. Assignment is based on serological analysis of blood samples collected from the fattening pigs. The knowledge of prevailing serovars of *Salmonella* by bacteriological methods is essential to develop and/or evaluate the serological method. The purpose of this study was to assess the serovars most frequently isolated on these assigned risk farms in Belgium and to evaluate the correlation between serological status and bacteriological prevalence.

Materials and methods

Every four months every Belgian pig farm with presence of at least 31 fattening/finishing pigs needs to collect blood samples from 12 fattening pigs for the National Aujeszky-disease screening program. Since 2005 these samples are also used for the National *Salmonella* surveillance and control program. All samples are analyzed using an indirect LPS-*Salmonella* ELISA (Idexx Laboratories, HerdChek* Swine *Salmonella* Antibody Test Kit). Since July 2007, risk farms are identified as farms with a mean S/P-ratio, from 12 fattening pigs, equal or higher than 0.6 for 3 successive sampling events.
The bacteriological herd status on these farms was examined using environmental samples through overshoes. On each assigned farm 4 pair of overshoes were collected from 4 different weight categories: ≤ 40kg, 40-59 kg, 60-79 kg, ≥ 80 kg. Bacteriological analysis for *Salmonella* was performed by means of a

standard enrichment method according to ISO 6579-Annex-D (MSRV). *Salmonella* strains were serotyped at the National Reference Laboratory for *Salmonella* (VAR), according to the Kauffman-White scheme.

Results

From July 2007 until March 2009, 2191 samples (= pair of overshoes) were collected from 539 different pig farms. *Salmonella* was recovered in 639 (29%) samples from 308 (57%) different pig farms. Twenty-nine different serovars were identified.

Table 1. *Salmonella* enterica serovars identified from 308 *Salmonella* risk farms in Belgium (2007-January 2008)

serovar	positive sample N	% of all positive samples
Typhimurium O5+	257	40,2
Typhimurium O5-	114	17,8
O4 : I : -	61	9,5
Derby	32	5,0
Livingstone	21	3,3
Brandenburg	10	1,6
Panama	8	1,3
Infantis	6	0,9
Typhimurium	6	0,9
Ohio	5	0,8
Rissen	5	0,8
London	5	0,8
Goldcoast	3	0,5
O4,5:I:-	3	0,5
Bovismorbificans	3	0,5
Agona	3	0,5
Enteritidis	2	0,3
O4:-:-	2	0,3
Cerro	1	0,2
O4	1	0,2
O6,7 : - : L,W	1	0,2
018 : Z4,Z23	1	0,2
Anatum	1	0,2
Mbandaka	1	0,2
Newport	1	0,2
Worthington	1	0,2
S. O3,10	1	0,2
O4,5 : I :-	1	0,2
O6,7 : - : L,W	1	0,2
Typing in progress	78	12,2
Non-typable	4	0,6
TOTAL	**639**	

On the assigned farms 1 (n = 124), 2 (n = 89) and 3 (n = 41) out of 4 pairs of overshoes were positive. Only on 49 farms all pairs of overshoes were positive (Table 2). Different serovars could be found on the same herd.

Table 2. Number of positive overshoes on the assigned risk farms

pair of overshoes positive	number of farms
1 out of 4	124 (41%)
2 out of 4	89 (29%)
3 out of 4	41 (14%)
4 out of 4	49 (16%)

No significant differences ($P > 0.05$) in the number of positive samples between the different weight categories could be observed (Table 3).

Table 3. Positive samples per weight category

weight category	number of positive samples
< 40kg	135
40 - 60 kg	154
60 - 80 kg	127
>80kg	167

Discussion

Based on serological screening, in 57% of the assigned pig farms there is a confirmed excretion by bacteriological isolation. Although the approach is quite different between the serological evaluation method and the bacteriological isolation technique, not only in methodology but also in number of examined samples, we could conclude that the observed correlation between bacteriology and serology is sufficient in the first stage of the SAP. However, continuous monitoring of bacteriological and serological results will still be necessary in order to fine-tune and develop a credible SAP based on diagnostic tools.

Conclusion

In 57% of all the assigned farms, based on serological screening (= mean S/P-ratio's), there is 'firm evidence' by bacteriological isolation. This suggests that a sufficient correlation is achieved at herd level in the first stage of the SAP.

References

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