Pig herds free from pathogenic *Y. enterocolitica* – dream or reality?

Nesbakken, T.*[1], Iversen, T.[2], Lium, B.[3]

[1] Norwegian School of Veterinary Science, Dept. of Food Safety and Infection Biology, P.O. Box 8146 Dep., N-0033 Oslo, Norway
[2] Nortura, P.O. Box 360 Økern, N-0513 Oslo, Norway
[3] Norwegian Pig Health Service, Animalia, P.O.Box 8156 Dep., 0033 Oslo, Norway
*corresponding author: truls.nesbakken@veths.no

Abstract

The results indicate that 15 of the 16 SPF (specific pathogen free) herds examined may be free from *Y. enterocolitica* O:3. In a broad perspective this investigation indicates that it is possible to establish cluster of pig herds free from *Y. enterocolitica* O:3, and to keep the herds free from the bacteria for many years. According to serological testing, the basic herd at the top of this SPF pyramid seem to have been free from this pathogenic variant since 1996. A total of 14 herds are confirmed negative also by culture.
By a systematic work it should be possible to market pork from pigs reared in herds documented free from *Y. enterocolitica* O:3.

Introduction

Yersinia enterocolitica serotype O:3 is the most common cause of yersiniosis in man in Europe (Nesbakken, 1992). In a case-control study, raw or undercooked pork have been identified as the main source of this infection in Norway (Ostroff et al., 1994). Based on serological surveys *Y. enterocolitica* O:3 seems to be common in the Norwegian pig population (Skjerve at al., 1998).
The aim of this study was to investigate the possibility of establishing and maintaining a cluster of pig herds free from *Y. enterocolitica* O:3.

Material and methods

Herds: In 1996 a specific-pathogen-free (SPF) nucleus herd (herd 1) was established by hysterectomi, and the piglets were reared without contact with other pigs. In 1999 a second nucleus SPF herd (herd 2) was established with gilts recruited from herd 1. Afterwards these two herds have been totally isolated from pigs in other herds, except for the use of semen from Norsvins AI-station.
Since 1997 another 17 conventional SPF herds have been established with gilts recruited from one or both of the above-mentioned SPF nucleus herds. The conventional herds have since they were established either been closed or they have bought replacement gilts from one of the two SPF nucleus herds.

The basis for the methods used and the time for collection of samples is presented in the study of Nesbakken et al. (2006) presented in Figure 1.
Blood samples: Since 1996, blood samples from 30 to 60 pigs in herd 1 have been taken every year and tested for antibodies against *Y. enterocolitica* O:3, whilst blood samples from 30 pigs in herd 2 have been collected and tested yearly since 2001. In 2004 and 2005 blood samples from 20 to 60 pigs from 14 of the conventional SPF herds have been tested. The majority of the blood samples have been from 4- to 6-month-old fatteners or gilts, while some samples from the two nucleus herds have been from sows.

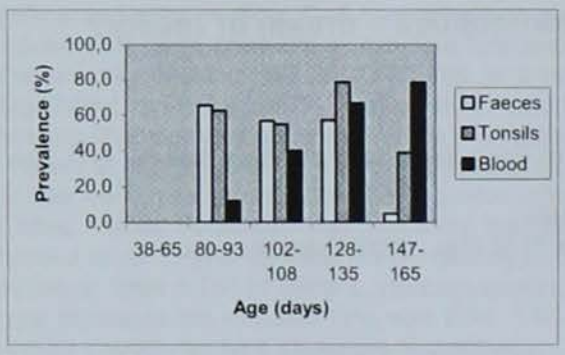

Figure 1. The basis for collection of samples and methods used in this study. Occurrence of *Y. enterocolitica* O:3 in samples from faeces and tonsils, and occurrence of antibodies against *Y. enterocolitica* in blood samples from different age groups of pigs (Nesbakken et al., 2006)

Serology: The sera were analysed for antibodies against *Y. enterocolitica* O:3 by a LPS-ELISA (Nielsen et al., 1996). A basic cut-off of optical density (OD%) 20 was used. The analyses were performed at the Danish Institute for Food and Veterinary Research.
Bacteriology: The bacteriological examination of faeces from 20 animals from each of 14 herds in 2005 or 2006 was performed according to International Organization for Standardization (1994) method (ISO 10273) with modifications (Nesbakken et al., 2006).

Results

The serological results are summarized in Table 1. During the first five years 10 of 174 blood samples from pigs in herd 1 had a low level of antibodies against *Y. enterocolitica* O:3 (OD%: <30). None of the 163 blood samples taken from pigs in this herd from 2002 to 2005 have tested positive. Only one of the 16 herds examined (herd 14) has been classified as serologically positive for antibodies against *Y. enterocolitica* O:3, This is the only herd which was positive by culture.

Discussion

The serological investigation indicates that 15 of the 16 SPF herds examined may be free from *Y. enterocolitica* O:3. The low positive reactions in some blood samples from pigs in herd 1 during the first five years may have been unspecific reaction because many of these samples were from old sows which may have more serological interference. At the moment we have no explanation of why herd 14 has been infected with *Y. enterocolitica* O:3.
This investigation indicates that it is possible to establish cluster of pig herds free from *Y. enterocolitica* O:3, and to keep the herds free from the bacteria for many years. The serological results are supported by bacteriological investigation of faeces. Fourteen herds have already been confirmed negative by culture in 2005 or 2006.

Table 1. Results of testing for antibodies against *Y. enterocolitica* O:3 in blood samples from pigs in a closed system of 15 SPF herds in Norway. **Herds in "bold" are confirmed negative by culture for *Y. enterocolitica* in 2005 or 2006.**

Herd no. (year of establishment)	Serology no. pos/no. tested
1 (1996)	**10[1]/337**
2 (1999)	**0/120**
3 (1997)	**1/61**
4 (1997)	**0/19**
5 (1998)	0/30[2]
6 (1999)	**0/34**
7 (1999)	**0/20**
8 (2000)	**0/60**
9[3] (2001)	0/30
10 (2002)	**1/61**
11 (2002)	**0/20**
12 (2003)	**0/30**
13 (2003)	**0/41**
14 (2004)	**15/30[4]**
15 (2004)	**0/20**
16 (2004)	**0/30**

[1] All these samples had OD% < 30
[2] Not investigated by culture
[3] Not a SPF–herd anymore
[4] 11 of 24 faecal samples positive for *Y. enterocolitica* O:3 by culture

Conclusions

By a systematic work it should be possible to market pork from pigs reared in herds documented free from *Y. enterocolitica* O:3. That means that the whole breeding pyramid has to be free from pathogenic *Y. enterocolitica*. In this context, our preliminary results are promising.

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