'THE DANISH SURVEILLANCE OF SALMONELLA IN PORK

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The Danish Salmonella surveillance programme consists of the following parts: (I) Monitoring of animal feed; (II) Monitoring of breeding and multiplying herds and of herds producing more than 100 slaughter pigs annually; (III) Monitoring of slaughterhouses, including surveillance of Salmonella in pork (Emborg et al., 1996). The surveillance of Salmonella in pork was initiated in the summer 1993, ordered by the Danish Veterinary Service.

MATERIAL AND METHODS

The herd monitoring scheme is based upon detection of specific Salmonella antibodies by a so-called Mix-ELISA (Nielsen et al., 1995). The assay can be used on both serum and meat juice. Meat juice is obtained, when frozen meat samples from slaughterpigs are thawed. The slaughterhouses collect meat samples continuously with samples being taken at random from each herd. Based on the proportion of seroreactors during the previous three month, the herds are assigned to one of three levels, Level 3 being the herds with an unacceptable high proportion of seroreactors (Bager et al., 1995).

The preliminary serological surveillance was initiated in July 1994 and included all herds producing more than 2650 slaughterpigs per year. The permanent serological surveillance was initiated in January 1995 and consists of representative sampling of about 16,000 herds producing more than 100 slaughterpigs annually (Emborg et al., 1996).

The Danish Veterinary Service requires that pigs from Level 3 herds are slaughtered under special hygiene precautions. This includes that pigs must be delivered as late as possible on the day of slaughter, and slaughtered as the very last pigs. Heads of carcasses are not split during slaughter, and plucks and abdominal viscera are either rejected or heat treated. To monitor potential contamination of the carcasses with Salmonella during exvisceration the carcasses are subjected to random microbiological testing by swabbing a 1,400 cm² area of the carcass surface. If more than 25 % of the samples are positive, that particular group of carcasses are heat treated or brine cured.

The regulations for the Surveillance of Salmonella in pork are laid down by the Danish Veterinary Service, and on a national basis approximately 2,200 samples are analysed every month. The number of samples collected at each slaughterhouse is proportional to the number of pigs slaughtered. The samples are divided into the following main groups: (10) Bone-in meatcuts; (20) Boneless meatcuts; (30) Offal, excluding tongues; (31) Tongues; (32) Slaughter by-products; (40) Trimmings and minced meat for retail sale; (50) Trimmings and meat for further processing.

For the main groups 10, 20 and 40 the Danish Veterinary Service accept a Salmonella

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prevalence of 5 %, while the acceptable prevalence for the main groups 30 and 50 is 10 %. The main groups 31 and 32 are not included in the surveillance, consequently there are not defined an acceptable Salmonella prevalence.

The government regulations prescribe the use of a destructive sampling technique that includes as large a surface area as possible. Each sample is subjected to qualitative analysis of 25 g of meat either by traditional microbiological culture or by use of an approved rapid Salmonella detection method. All laboratories carrying out the Salmonella analyses must be approved by the authorities, and the laboratories are controlled by the Danish Veterinary Service.

Slaughterhouses belonging to The Federation of Danish Pig Producers and Slaughterhouses send the results to the organisation's head office, where they are entered into a database before being forwarded to the Danish Veterinary Service. Privately owned slaughterhouses send their results directly to the head office of the Danish Veterinary Service.

RESULTS AND DISCUSSION

The data presented in this paper originate only from slaughterhouses who are members of The Federation of Danish Pig Producers and Slaughterhouses.

*Fresh pork*: Before September 1994 the prevalence of Salmonella in pork ranged from 1.6 to 2.9 % (mean 1.8 %), Fig 1. In September 1994 the first results of the preliminary serological surveillance were available to the slaughterhouses, and pigs from level 3 were slaughtered under special hygiene precautions. From September 1994 to January 1996 a reduced prevalence of Salmonella in pork was found ranging from 0.3 to 1.2 % (mean 0.8 %). For the first 3 quarters of 1996 an increase in prevalence of Salmonella in pork was found varying from 0.8 to 2.1 % (mean 1.3 %). However, in the last quarter of 1996 and the first quarter of 1997 the prevalence of Salmonella in pork has again been below 1.0 %.

![Graph](image)

Fig. 1. The prevalence of Salmonella in pork from July 1993 to March 1997. The average number of samples analysed per month is 1,327.

A Chi-square test comparing the data from 1995 with the data from 1996 showed a significant increase (P=0.001) in the prevalence of Salmonella in pork from 1995 to 1996. The increase in Salmonella positive fresh pork samples in the first 3 quarters of 1996 appears to be associated with a concurrent increase in the proportion of especially Level 2 herds, but also in Level 3 herds being registered in the beginning of 1996.
Offal: From July 1993 to November 1993 tongues were included in the main group 'Offal'. However, tongues may be contaminated with Salmonella because the pigs eat dung from other pigs, consequently contamination of the tongues with Salmonella does not depend on the slaughter hygiene. As a consequence tongues were transferred to a separate main group, group 31, and are no longer part of the surveillance. Instead, from January 1994 Danish pig tongues must be heat treated, unless certain demands are met.

From January 1994 to July 1994 the prevalence of Salmonella in offal varied from 6.3 to 10.8% (mean 8.2%), Fig 2. From September 1994 to March 1997 a reduced prevalence of Salmonella in pork was found ranging from 1.8 to 7.7% (mean 4.1%).

![Graph](image)

Fig. 2. The prevalence of Salmonella in offal from January 1994 to March 1997.
The average number of samples analysed per month is 327.

By monitoring the prevalence of Salmonella in pork it is possible to monitor the effects of the control efforts in the primary production ('Pre-harvest') and at the slaughterhouses ('Post-harvest'). The above makes it possible to take action if an increase is observed and thereby hopefully reduces the incidences of human Salmonellosis caused by Salmonella in pork.

Furthermore, at the slaughterhouses the data can be used as a tool to surveille critical dressing procedures and thereby be a part of the slaughterhouse's own checks.

REFERENCER

