Epidemiology of *Yersinia enterocolitica* O:3 in humans and pigs in Denmark.

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Abstract: The prevalence of *Yersinia enterocolitica* O:3 in humans, monitored from 1985 to 2000 by bacteriological examination of patients with diarrhoea, was compared with seroprevalence data from finisher pigs and bacteriological results from meat samples. The number of patients diagnosed with *Y. enterocolitica* O:3 infection declined consistently from 1500 cases in 1985 to 265 cases in 2000. Two cross-sectional studies carried out at the slaughterhouse showed a seroprevalence in finishers of 66.7% in 1993, compared with 69.2% in 2000. The prevalence of *Y. enterocolitica* O:3 in pork was low: 2.0% in 1997 and 3.2% in 1999, respectively. Since 1980, faecal contamination at Danish slaughterhouses has fallen to a level below 2% since 1993 following measures to improve slaughter hygiene. It is discussed whether these hygienic measures alone can account for the decrease in human yersiniosis observed in Denmark.

Keywords: *Yersinia enterocolitica* O:3; prevalence; humans; pigs; pork.

Introduction: The aim of the present study was to compare the prevalence of *Yersinia enterocolitica* O:3 in humans, pigs and pork over the past decade. In Denmark, the number of patients examined for diarrhoea has been increasing steadily during the 1990's, till around 150,000 faeces samples in 2000. In contrast, the number of patients diagnosed with *Yersinia* infection has been declining consistently from 1500 cases in 1985 to 266 cases in 2000 (Anonymous, 2001). As the majority of human *Y. enterocolitica* infections in Denmark are serotype O:3, pigs are thought to be the primary source of infection. A study carried out in 1993 showed that more than 70% of Danish herds were seropositive for *Y. enterocolitica* O:3 (Nielsen et al. 1996a), but no seroprevalence data have been collected since. In contrast to *Salmonella*, the occurrence of *Yersinia* in fresh meat products is not monitored on a regular basis, but in 3 regional retail surveys a very low prevalence of *Y. enterocolitica* was found in pork. The *Y. enterocolitica* isolates found were
not always biotyped and serotyped, but most were assumed to belong to apathogenic strains (Anonymous, 2001).

**Materials and Methods:** The prevalence of *Yersinia enterocolitica* O:3 in humans has been monitored from 1985 to 2000 at the State Serum Institute by bacteriological examination of patients with diarrhoea. *Yersinia* was isolated from patients by culture of faecal suspensions in saline streaked on SSI Enteric Medium after overnight incubation at 36°C. Final identification was performed using standard methods. Data were made available for this study by the Danish Zoonosis Centre. In addition, cross-sectional studies in finisher pigs were carried out at the slaughterhouse in 1993 and 2000, respectively. Blood and/or meat juice samples were collected randomly from 25 slaughterhouses throughout Denmark. The total number of samples collected was 1144 in 1993 and 1045 in 2000, respectively. The samples were analysed using a *Y. enterocolitica* O:3 LPS-ELISA technique with cut off OD% >10, adapted from Nielsen et al. (1996b). Finally, data on *Yersinia* in pork were available from 3 cross-sectional surveys at retail level carried out in 1997, 1999 and 2000, respectively.

**Results:** The results are presented in Figure 1. The number of human cases has decreased steadily from 967 cases in 1990 to 265 in 2000. In contrast, the frequency of seropositive finishers has remained unchanged: 66.7% in 1993 compared with 69.2% in 2000. The prevalence of *Y. enterocolitica* in pork was low, ranging from 2.0% in 1997 to 6.3% in 2000. However, no human pathogenic *Y. enterocolitica* was isolated from pork in 2000, while the samples collected in 1997 and 1999 were not typed but also assumed to be non-pathogenic.

**Discussion:** The observed decline in human *Yersinia* infections coincides with a similar decline in human *Salmonella* Typhimurium infections (Anonymous, 2001) since the implementation of the Nationwide Salmonella Surveillance and Control Program in 1993 (Mousing et al., 1997). However, the decline in human *Yersinia* infections started in the mid-eighties and coincided with a significant decrease in *Y. enterocolitica* contamination of freshly slaughtered pig carcasses following application of a mechanised bung cutter in connection with enclosing the anus and rectum in a plastic bag (Andersen, 1988). Faecal contamination at Danish slaughterhouses has subsequently fallen to a level below 2% since 1993. The prevalence of *Y. enterocolitica* O:3 in pigs has remained high throughout the last decade, but its influence is limited greatly by adequate slaughter hygiene, which is also apparent from the low level of *Yersinia* found in fresh pork. However, the decline in human *Yersinia* infections is not due to slaughter hygiene alone, but may also be due to changes in virulence or consumer related factors.
Figure 1: Prevalence (pigs) and incidence (human cases) of *Yersinia enterocolitica* O:3 in Denmark, compared with *Y. enterocolitica* (non typed) found in pork products.

References


