ELIMINATION OF VEROTOXIGENIC *Escherichia coli* O157 FROM A SPECIALISED BEEF-PRODUCING HERD

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Background.

The possibilities of controlling verotoxigenic *E. coli* O157 (VTEC O157) in animal production are not self-evident, but some options for limiting shedding from cattle are reported. Farm management practices including farming intensity, housing and the grouping of animals, feeding, manure/slurry management and the hygienic standard influence the spread of *E. coli* O157 *(Stewart and Flint, 1999)*. In Sweden, there is a long-standing tradition of controlling salmonella in farm animals, consisting of the identification and slaughter of salmonella-carriers, combined with the cleaning and disinfecting of stables. In the present study, a similar strategy was applied in a specialised beef herd, which had been found to be positive for *E. coli* O157.

Objective.

To eliminate verotoxigenic *E. coli* O157 from a beef herd.

Methods.

During the studied period, August 1997 - July 1998, the occurrence of *E. coli* O157 was studied in a specialised beef-producing herd at a cattle farm. The selected herd buys groups of 40-60 calves at the age of two months, four times a year for fattening. The farm consists of the welcoming barn (I), where the calves are kept on straw bedding for eight to ten weeks, the second barn II where they are kept in stable II A, and subsequently in stable II B on slatted floors for about five months.

Sampling was carried out on calves, the environment in the barn, feed, feed mixer and liquid manure. Samples were diluted 1:10-1:20 with buffered peptone water (BPW; Oxoid CM 509), and analysed for *E. coli* O157 (Handbook Dynabeads® anti-*E. coli* O157 710.03/04; Dynal AS, Oslo, Norway). Isolates were analysed for *vt*1, *vt*2 and *eaeA*-genes by PCR, and RFLP-typing was performed.

Results and Discussion.

Initial status of the herd. In August, *E. coli* O157 was found in faecal material sampled from the slatted floor in two of the 14 pens in finishing stable II B. In October, 9 out of 40 (22%) calves in stable IIB harboured *E. coli* O157; spread throughout the whole stable.

Environmental sampling showed the prevalence of *E. coli* O157 at several locations in stable II B, i.e. a spade, fans ventilating the stable, the weighing-crush, wires under the slatted floor, manure drain, stored liquid manure and poles. Several of the sampling locations were, at the time of sampling, dry and dusty, confirming good survival in places that are not cleaned. None of the 18 samples taken from the feed (concentrate; hay, barley and wheat-grain) or the feed mixer were positive for *E. coli* O157.

No *E. coli* O157 were detected in Stable II A or the welcoming barn, demonstrating that the contamination was only established in stable II B.

All *E. coli* O157 isolated during August 1997 and December 1997 from faecal material or the environment had *vt2*- and *eaeA*-genes, and belonged to the same subtype, according to RFLP. This finding is in accordance with *Shere et al. (1998),* reporting a high similarity among isolates from the same farm. In cattle herds, *E. coli* O157 in the intestinal tract is a transient event *(Hancock et al., 1997; Rahn et al., 1997)*, and shedding is intermittent as a result of an environmental source *(Zhao et al,. 199;, Shere et al., 1998)*.

Strategy for the elimination of E. coli O157. No new calves were moved into stable II B. Five of the positive calves were sent to slaughter. The four remaining positive calves were moved to the same pen row, separating them from the 31 negative calves. Cleaning was performed using high pressure and subsequent disinfection with Virkon S (Ewos, Sweden). The individual sampling of all 35 calves after cleaning revealed nine (26 %) positive. None of them had earlier been identified as positive. These positive calves were distributed in different rows of pens, indicating a spread of the bacterium via aerosols during cleaning. Samples from the environment revealed the presence of *E. coli* O157 in different positions.

To further reduce the number of calves, 27 were sent to slaughter, most of them being positive on one or several occasions, or being penmates with positive calves. Thorough cleaning and disinfection was performed twice, as described above. After the floor had dried, it was powdered with lime. Nine calves were left in the stable, when the calves from stable II A were moved to stable II B in December. Analysis of the calves and pens revealed no samples positive for *E. coli* O157.

Repeated cleaning and disinfection were necessary to remove *E. coli* O157 from the environment. This was to be expected, since the dirt was firmly deposited in the environment in the stable, which is never empty or cleaned routinely. Thorough cleaning and disinfection with Virkon S, in combination with lime treatment of the slatted floor, was able to remove the bacterium. This should preferably be performed on a routine basis in barns and stables, in order to prevent the establishment of the bacterium in the stable environment. At the same time, all VTEC-positive calves should be sent to slaughter to avoid fresh recontamination of the environment. It appeared that the aerosols could carry the bacterium during cleaning, therefore the stable should be emptied before cleaning.

Status following measures. In December, the calves in stable II A were moved to stable II B. In February and March, all the

calves in the three stables were analysed individually. No *E. coli* O157 was recovered. In May, samples of faecal material from the pen floors in stable II B still showed no *E. coli* O157. All environmental samples were also negative.

The elimination of *E. coli* O157 from the farm was probably due to the success of the measures, and not to the cold season during which the study was done. A tendency towards seasonal shedding has been reported by *Hancock et al. (1994),* with rates being highest in June, July and September. On the contrary, *Mechie et al. (1997)* reported peaks in shedding in a dairy herd in May- July and November after the cattle had been housed. The movement of animals and animal-to-animal contact are, thus, factors that may be as important as seasonal variation.

New contamination introduced by arriving calves. Four groups of new calves arrived at the farm in September, December and January. They were individually analysed for *E. coli* O157; no positive samples were found. In April, the sampling of 60 newly-arrived calves demonstrated that two were positive for *E. coli* O157. In June, individual sampling demonstrated 13% positive calves. Thus, buying calves from many different dairy farms is an important risk factor. In Sweden, *E. coli* O157 is found in 10% of dairy farms (unpublished data from 1998/1999).

Conclusions.

- *E. coli* O157 may become established in the barn or stable environment.
- A cattle herd may be purged of *E. coli* O157 by slaughtering positive animals, together with the cleaning and disinfection of the stable environment.
- Through exchanging calves from dairy herds, new contamination can be continuously introduced.
- Finding appropriate risk management measures for calves introduced into beef producing herds is an urgent challenge.

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