

AN INVESTIGATION OF THE EFFECT TRANSPORT AND LAIRAGE OF FEEDLOT CATTLE ON THE CAMPYLOBACTER PREVALENCE IN FAECES AND ON DRESSED CARCASSES

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Introduction

Campylobacter is an emerging zoonotic pathogen worldwide. In Ireland, there were 2,085 and 1,613 laboratory confirmed cases of illness due to *Campylobacter* spp. in 1999 and 2000, respectively (Whyte and Igeo, 2000; Foley and McKeown, 2001). The possibility of low infectious doses combined with high incidence of infection and the serious potential sequelae for man makes campylobacteriosis an important public health disease.

Most patients with campylobacteriosis present as sporadic cases and person-to-person transmission is uncommon (Pebody *et al.*, 1997; Alterkruse *et al.*, 1998). Poultry has been identified as a significant risk factor for sporadic campylobacteriosis (Kapperud *et al.*, 1992; Lior, 1996). However, cattle produce and direct contact have also been associated with campylobacteriosis (Butzler and Oosterom, 1991; Skirrow, 1991; Pearson and Healing, 1992; Troutt and Osburn, 1997; Fitzgerald *et al.*, 2001; Neimann *et al.*, 2003).

Campylobacter is an organism often found in the gastrointestinal tract of cattle with reported prevalences ranging from 0-80% (Munroe *et al.*, 1983; Rosef *et al.*, 1983; Giacoboni *et al.*, 1993). The aim of this study was to investigate what effect, if any transport and lairage of cattle before slaughter had on the qualitative and quantitative shedding of *Campylobacter* in their faeces.

Material and Methods

A cohort of 109 heifers aged 27 to 30 months from a single Irish feedlot were investigated. The cattle were housed in four adjacent pens and remained in their assigned pen until slaughter. The cattle were then transported during March and April in three groups of 44, 44, and 21 respectively on three separate days for slaughter. The duration of the transport was six hours. The animals were held in lairage over night (12 hours) with *ad libitum* access to water. The abattoir used in this study was an approved Irish export abattoir, processing approximately 80,000 cattle per year with a throughput of 60 animals per hour during sampling for the study. The decontamination procedures used in this abattoir consisted of trimming and a hot water (62°C) carcass wash.

Individual rectal faecal samples were taken from the cattle at the feedlot on the day of transport approximately 4 hours prior to departure, then immediately upon arrival at the lairage, and again following lairage immediately prior to slaughter. At the abattoir all carcasses were swabbed in the chillroom within thirty minutes of entry, as previously described (Minihan *et al.*, 2003). The level of *pre-mortem* faecal contamination of the cattle was assessed immediately prior to slaughter by utilising a subjective tag scoring system (0-9).

Campylobacter was isolated using an enrichment (Preston broth) and selective agar (modified charcoal cefoperazone deoxycholate agar). Colonies with the characteristic gross morphology and curved or spiral Gram-negative rods were presumptively identified as *Campylobacter*. The limits of detection of *Campylobacter* was < 1 log CFU.gram⁻¹ of faeces and 2 log CFU.4000cm⁻² of carcass surface. *Campylobacters* were enumerated for 30 animals at each of the sampling points onto mCCDA. Colonies with the characteristic gross morphology were counted as *Campylobacter* colonies. Each *Campylobacter* was identified to the species level by the use of a biochemical test (Camp IDTM, Mast Diagnostics, Merseyside, England) or polymerase chain reaction (PCR) amplification of the 23S rRNA target.

Bacterial counts obtained were transformed to log₁₀ CFU/gram of faeces. The effect of transport and both transport and lairage combined on the quantitative shedding of *Campylobacter* per gram of faeces was compared using a paired Student t-test with significance defined at the 95% level ($P \leq 0.05$). The *Campylobacter* shed per gram of faeces for each sampling point was compared between each visit using an unpaired t-test with significance defined at the 95% level ($P \leq 0.05$). The prevalence of faecal *Campylobacter* shedding at each of the sampling points was compared statistically using a Chi-square test, with significance defined at the 95% level ($P \leq 0.05$). The "StatView 5" programme (SAS Institute Inc., USA) was used for the statistical analysis.

Results

Campylobacter spp were isolated from 191 (58%) of the 327 faecal samples from all three sampling points. 82% (90) of the 109 animals in this study shed *Campylobacter* on at least one occasion during this study. At each of the three sampling points *Campylobacters* were isolated from 62 (57%), 60 (55%) and 69 (63%) of the farm, post-transport, and post-lairage samples respectively. There was no significant difference in the levels of *Campylobacter* faecal shedding at each of these sampling points.

Of the 191 *Campylobacter* isolates 179 were identified to species level, consisting of 70% (126) *C. jejuni* and 30% (53) *C. coli*. The proportion of *C. jejuni* to *C. coli* shed in the cattle faeces changed significantly between the farm and post-lairage sampling points ($P < 0.05$).

A trend of decreasing numbers of *Campylobacter* spp. shed in cattle faeces from farm to post-transport and post-lairage was observed during all three visits. The observed reduction in *Campylobacters* shed per gram of faeces between sampling at farm and post-lairage was statistically significant for visit one and for the combined data from the three visits ($P < 0.05$).

Campylobacter was not recovered from the swabs of the 109 dressed carcasses at the abattoir. Visual inspection of all the dressed carcasses in the present study revealed no visible faecal contamination. The mean hide tag score of the 109 animals immediately before slaughter was 4.8, ranging from 2 to 9.

Discussion

The prevalence of *Campylobacter* spp. shed in faeces in our study was high at 58% for feedlot cattle, but consistent with previous reports (Garcia *et al.*, 1985; Giacoboni *et al.*, 1993). However, others reported a contrasting lower prevalence of cattle *Campylobacter* spp. faecal shedding, ranging from 0.8 to 2.5% (Prescott and Bruin-Mosch, 1981; Rosef *et al.*, 1983; Warner *et al.*, 1986).

The shedding prevalence between farm and post-lairage only differed by 6% (57% to 63%). Transport and lairage neither increased nor decreased significantly the prevalence of faecal *Campylobacter* shedding ($P > 0.05$). These results are consistent with a previous study (Beach *et al.*, 2002). These insignificant changes in faecal shedding prevalence of *Campylobacter* spp. in response to the transportation and holding of cattle in lairage, contrast with those observed for other enteropathogens including *Salmonella* spp. in cattle and pigs, which have been shown to increase from farm to abattoir (Berends *et al.*, 1996; Barham *et al.*, 2002; Beach *et al.*, 2002). We postulated that differences in the faecal shedding prevalence of *Campylobacter* and *Salmonella* in might be accounted for by differences in the colonisation mechanisms of these bacteria.

Transport and lairage resulted in a significant reduction ($1 \log_{10} \text{CFU.gram}^{-1}$) in the number of *Campylobacter* spp. shed per gram of faeces. This finding contrasts with a study which reported a ten-fold increase in faecal *Campylobacter* counts shed by broilers after transport (Whyte *et al.*, 2001). The authors postulated that the difference in the mean counts after transport and lairage could be due to differences in the mechanisms of colonisation and the responses of the hosts to the stresses of transportation and lairage.

In the present study, no *Campylobacter* spp. were detected on dressed carcasses, demonstrating that known positive cohorts of cattle, with a wide range of tag hide scores may be slaughtered and processed to produce clean carcasses by following good hygienic practices.

Conclusion

Transport and lairage did not result in an increase in the number of animals shedding *Campylobacter* spp. in faeces. In addition, transport and lairage result in a $1 \log_{10}$ decrease of *Campylobacter*s shed per gram of cattle faeces. The study demonstrated that an observed low level of this pathogen could be achieved on dressed carcasses when appropriate standards of hygiene are attained and maintained in abattoirs.

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