Prevalence and Risk Factors of Pathogenic *E. coli*, including 0157:H7, in Western Canadian Cow-Calf Herds

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Abstract

There is increasing concern about the potential impact of intensive livestock operations on the environment and the risk that they potentially pose to human health. The purpose of this project was to identify the prevalence of pathogenic *Escherichia coli* in calves at calving and the risk factors associated with infection. Fresh fecal samples were collected from 876 calves on 139 farms in the spring of 2002. The sample collection was a random sample from calves in the calving/ nursery area. The fecal samples were scored on a scale of 0 to 3 (0=firm, 3=watery) to identify fecal consistency. Samples were submitted on ice to the laboratory. Data were collected to assess risk factors for shedding, including herd management factors, age, sex, breed, health status/clinical signs and treatment history. The samples were cultured onto MacConkey agar plates at 37°C for 18 hours for isolation of *E. coli*. Five to 10 lactose fermenting, morphologically identical colonies were pooled and identified as *E. coli* using standard biochemical tests. The isolates were examined for presence of shiga-toxin 1 (Stx1), shiga-toxin 2 (Stx2) and EAE (*E. coli* attaching and effacing factor) virulence factors using DNA hybridization. Positive isolates were O-serotyped by slide agglutination. From the 876 calves, 990 *E. coli* isolates were saved for further testing. Of these 8.7% (86/990) were positive for Stx2, 5.4% (53/990) were positive for Stx1 and 3.6% were Stx1/Stx2 positive. EAE was detected in 4.3% (41/990) of the isolates. Of the 139 farms, 40.3% (56/139) were positive for Stx2, 25.8% (36/139) were positive for Stx1, 20.1% (28/139) were positive for Stx1/Stx2 and 18.7% (26/139) were positive for EAE. Eighty percent (709/876) of the samples were collected from calves 2 to 10 days of age. In calves 2 to 10 days of age, 7.9% (56/709) were positive for Stx2, 4.3% (31/709) for Stx1 and 2.7% for EAE. Preliminary serotype results from 49 samples indicate that 55% (27/49) cannot be typed. Two serotypes associated with human disease were found at a rate of 4.08% (2/49) for 0157, and 2.0% (1/49) for 0103. Serotypes implicated in calf septicemia or diarrhea that were isolated included; 6.1% (3/49) 08, 10.2% (5/49) 088, and 6.1% (3/49) 015. Final serotype results are pending. The association between management factors and the presence of various genotypes and serotypes were evaluated to aid in the development of farm level control strategies.

BVD and Neospora Infection and Reproductive Performance in Beef Cows

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BVD and *Neospora caninum* are both widely recognized causes of abortion and reproductive losses in beef and dairy herds. Several recent projects have examined the role of *N. caninum* in both catastrophic losses and routine reproductive performance in cow-calf herds. BVD is also widely recognized as a leading cause of infectious pregnancy failure.

Veterinarians routinely collect blood samples and analyze for these pathogens during herd investigations as part of our diagnostic work up. However, the laboratory results from those samples can often leave us with more questions than answers. How do we interpret positive titers for *N. caninum* at the individual animal or herd level? Can we relate these laboratory data to reproductive losses? Why do some herds with evidence of high levels of infection have very little evidence of reproductive problems? Problems also occur in the diagnosis of poor pregnancy rates potentially associated with

BVD. We expect that background levels of BVD antibodies will be present in most herds, making serological profiling very difficult to interpret. There has also been speculation that, in some cases, BVD may work with *N. caninum* to trigger or exacerbate reproductive losses in beef herds.

During the fall of 2001, blood samples were collected from more than 2500 cows from 65 herds across western Canada at pregnancy testing. Serological screening tests were used to examine samples from both open and pregnant animals from 35 herds with pregnancy rates greater than 90%, and compare them to samples from 30 herds with pregnancy rates less than 90%. All open cows were bled in each herd, and a random sample of pregnant cows were bled, for a total of 40 samples per herd. The study addressed the question of whether IBR, BVD, Neospora, or BVD and Neospora together increase the risk of individual animal pregnancy failure or the risk of herd pregnancy failure. The results of this study will be reviewed to explore the individual and potential combined role of these pathogens in reproductive performance in cow-calf herds.

Geographical Difference in Prevalence of *Escherichia coli* O157 in Finished Beef Cattle

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As part of a larger study to measure the feedlot pen prevalence effects of *Escherichia coli* O157 on carcass contamination, 15 pens of cattle were sampled from 12 different feedlots in three states. Thirty fresh pen floor samples were collected prior to slaughter. Other variables included sex, days on feed, weight, number, pen condition and feedlot geographic location. Fecal samples underwent standard enrichment, immunomagnetic separation and isolation procedures for *E. coli* O157. Pen level prevalence of *E. coli* O157 ranged from 0 to 77.8%. Eastern Colorado feedlots had an average prevalence of 20.7%, while central Nebraska feedlots averaged 45.3%. Analysis using the GENMOD Procedure (SAS) was utilized in performing a Poisson regression in which clustering was controlled and generalized estimating equations for modeling were generated. The only significant variable in the model was geographic location and a multivariate model could not be established. Finished beef cattle from central Nebraska were likely to have more positive pen samples for *E. coli* O157 when compared to pens from eastern Colorado (RR = 2.5, 95% confidence interval = 1.1 to 5.8). This study demonstrates that pen prevalence of *E. coli* O157 varies by geographic location, and further investigations to characterize geographic distribution and associated factors should be initiated.