Umbilical cord care: effects on navel involution, calf health and growth

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Introduction

Despite the importance of umbilical disease as a risk factor for newborn calf morbidity, research data on umbilical cord care are lacking. Moreover, no practical technique for objective detection of umbilical disorders in calves under field conditions has been described. The primary objective of this study was to investigate the influence of umbilical cord care on navel infection. A secondary objective of this study was to describe umbilical involution in calves receiving different navel dips using ultrasonography. To improve applicability for veterinary practitioners and researchers alike, an ultrasound device was chosen that would commonly be used in the field.

Materials and Methods

The study was carried out on a commercial dairy farm. Calves were enrolled in the study following a completely randomized block design and were blocked by day of birth. The treatment consisted of a single treatment of the umbilicus immediately after birth with one of three navel dips: chlorhexidine (group A), strong iodine (group B), and Navel Guard® (group C). A standardized weekly clinical examination as well as ultrasonographic evaluation of the umbilical structures was carried out during the first month of life. Passive transfer was evaluated using Brix refractometry. The case definition of umbilical infection was the presence of one or more of the following parameters: 1) positive pain response assessed following the standardized protocol; 2) presence of fistula with suppurative discharge; 3) diameter of the umbilical stalk >30 mm; 4) diameter of the umbilical stalk increased in size as compared to a prior evaluation of ≥10mm; 5) diameter of urachus of calves older than 2 days >10 mm (urachitis); 6) diameter of an umbilical artery >15 mm (omphaloarteriitis); 7) umbilical vein diameter >25 mm and hyperechoic lumen (omphalophlebitis), or consistency evaluated as firm. For the description of normal umbilical involution, data from calves with umbilical infection and/or hernia were excluded. A sample size of 141 animals in each group was calculated to detect a 10% difference in the incidence of umbilical infection between treatment groups at a significance level of $\alpha=0.05$ and with a power of 80%. Data were analyzed with the statistical software package SAS (v.9.3). The association between categorical variables was analyzed using chi-square, and the association between categorical predictors and continuous outcome variables with ANOVA. For the analysis of measurements of the umbilical diameters over time, repeated measures ANOVA was performed.

Results

The overall failure of passive transfer risk (Brix% ≤ 8.4) was 16.4% and was not different among groups ($P=0.59$). Mean Brix% (n=281) was 9.2 (95% CI: 9.1-9.3) and showed no difference among treatment groups ($P=0.53$). Umbilical infection was detected in 29.9% of all calves (n=84). On average, calves with umbilical infection at any of the time-points had lower Brix% compared with calves not suffering from omphalitis (9.0% ± 0.09 vs. 9.3% ± 0.06, $P=0.04$). The use of the three different navel treatments was not associated with the number of cases of umbilical infection ($P=0.91$). The diameter of the external umbilicus decreased from 15.6 mm ± 0.2 in week 1 to 10.6 mm ± 0.2 in week 4 (P (time)<0.001, P (group)=0.28, P (time*group)=0.32). The umbilical vein diameter decreased from 10.9 mm ± 0.2 (week 1) to 7.7 mm ± 0.1 (week 4) (P (time)<0.001, P (group)=0.83, P (time*group)=0.15).

Significance

There was no apparent difference in the effectiveness of the three different treatments in the prevention of umbilical infection; however, there was an association between colostrum quality and umbilical infection. The relatively high incidence of umbilical disease in this study illustrates the importance of the assessment of all umbilical structures for evaluation of this disorder in dairy calves. Ultrasonography is an excellent technique for the assessment of umbilical involution and an on-farm applicable diagnostic tool for umbilical disorders.