Do volume, immunoglobulin G content, and feeding method of the first colostrum meal impact subsequent nursing behavior and transfer of passive immunity in beef calves?

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Introduction

Over one-third of beef calves fail to achieve adequate transfer of passive immunity (TPI) through timely ingestion of colostrum, which significantly increases their risk of pre-weaning morbidity and mortality, and decreases their average daily gain. Evidence-based colostrum management guidelines are available for dairy, but not beef calves. Hence, 2 randomized clinical trials were designed with the following objectives: to assess the impact of (1) volume and immunoglobulin G (IgG) concentration, and (2) feeding method of the first colostrum meal on time to nurse the dam and TPI.

Materials and methods

For the first trial, a total of 47 beef calves were randomly assigned to receive 1 of 3 colostrum interventions by oro-esophageal tube feeder (OET): 1L with 100 g/L IgG, 1.4L with 70 g/L IgG, or 2L with 100 g/L IgG. For the second trial, 29 beef calves were randomly assigned to be fed 1L of colostrum product with 100 g/L IgG by either nipple bottle (NB) or OET. All colostrum interventions were completed within 60 minutes of birth and before calves could nurse their dams. Cow-calf pairs were then monitored in individual box stalls equipped with video surveillance cameras for 24 hours. Dam colostrum was collected within 10 minutes to account for subsequent IgG consumption by the calf. Calf serum was collected at 24-36 hours after birth to assess transfer of passive immunity. Differences among colostrum intervention groups on time to nurse were analyzed using Kaplan-Meier survival curves and Cox-proportional Hazard models. The impact of colostrum intervention group on TPI was assessed using multivariable linear regression modelling.

Results

In the first trial, calves fed the 1.4L with 70 g/L IgG by OET nursed from their dams significantly earlier (median: 103 minutes) compared to calves 1L with 100 g/L IgG (median 264 minutes, $P = 0.003$) and calves fed 2L with 100 g/L IgG (median 213 minutes, $P = 0.008$). Serum IgG concentrations at 24 hours were not significantly impacted by the volume of the first colostrum meal ($P = 0.15$) and none of the study calves showed failed TPI (IgG < 10 g/L). Six of the 15 calves in the NB group in the second trial refused to consume part of the colostrum feeding offered by bottle and required follow-up feeding of the remaining volume by OET. These calves were subsequently analyzed as a separate, third group (NB + OET). Calves fed 1L by NB nursed significantly earlier (median: 138 minutes) than calves fed by OET (median: 237 minutes, $P = 0.005$) or a combination of NB + OET (median: 553 minutes, $P = 0.003$). Serum IgG concentrations at 24 hours were not significantly impacted by feeding method ($P = 0.08$), and only 1 calf showed failed TPI.

Significance

Results of these 2 clinical trials have practical implications for colostrum management strategies in cow-calf operations. When using an OET, feeding a moderate volume (1.4L with 70 g/L IgG) of colostrum product within 60 minutes after birth can be recommended because such calves nursed their dams sooner than calves fed smaller or larger volumes of colostrum, while serum IgG concentrations at 24 hours were comparable among groups. When feeding a smaller volume (1L with 100 g/L IgG), the NB should be chosen over the OET, based on a significantly shorter time to nurse compared to calves fed partially or completely by OET. Lastly, findings of this study suggests that regardless of the approach used, beef calves receiving colostrum intervention within 60 minutes of birth are very unlikely to show failed TPI.

