Colostrum feeding is critical in shaping colon microbiota during the first 12h of life in dairy calves

Yang Song[1], ysong3@ualberta.ca; Nilusha Malmuthuge[1,2], malmuthu@ualberta.ca; Fuyong Li[1], fuyong@ualberta.ca; Le Luo Guan[1], lguan@ualberta.ca;

[1]Department of Agricultural, Food, and Nutritional Science, University of Alberta, Edmonton, AB, T6G 2P5
[2]Vaccine and Infectious Disease Organization-International Vaccine Centre University of Saskatchewan Saskatoon, SK, S7N 5E3

Colostrum feeding is crucial to facilitate the passive transfer of immunity in neonatal calves. A recent study reported that colostrum feeding also influences the small intestinal microbial colonization process. Hindgut microbiota also plays important roles in fermentation and gut health. Therefore, this study aimed to explore the effect of colostrum feeding on the mucosa and digesta-associated microbiota in the colon of dairy calves. Neonatal Holstein male calves (n = 20) were randomly assigned to no colostrum (NC, n = 8) and fresh colostrum (FC, n = 12) treatments immediately after birth. Calves in FC group received 2 L of colostrum within one hour after birth, while calves in NC groups did not receive colostrum or water. Calves were euthanized at either 6 hr (NC, n=4; FC n=6) or 12 hr (NC, n = 4; FC, n = 6) after birth. Quantitative real time-PCR was used to estimate the abundance of bacterial groups of interest (total bacteria, *Escherichia. coli*, *Bifidobacterium*, *Clostridium* cluster XIVa, *Faecalibacterium. prausnitzii*) in the colon. The effect of colostrum feeding (NC vs. FC) on the the copy number of 16S rRNA gene per gram of all bacterial groups was using nonparametric Wilcoxon rank-sum test method in R. After FC feeding, mucosa and digesta-associated bacterial densities increased significantly at 12 hr of birth (Mucosa-NC:$1.02\times10^{10}\pm0.55\times10^{10}$, Mucosa-FC: $4.69\times10^{12}\pm4.15\times10^{12}$, P=0.02; Digesta-NC: $3.14\times10^{10}\pm1.41\times10^{10}$, Digesta-FC: 7.59×10^{12} $\pm3.66\times10^{12}$, P<0.01), and it numerically increased at 6h of life. The abundance of *Clostridium cluster XIVa* and *Bifidobacterium* increased, while that of *E.coli* decreased in the colon of FC fed calves during the first 12 hr compared to NC calves. Our findings suggest that colostrum feeding enhances the colonization of beneficial bacteria and inhibit the colonization of potential pathogenic bacteria in the colon during the first 12 hr of life.