

Oligosaccharide and IgG concentrations throughout the first week of lactation in multiparous and primiparous Holstein dairy cattle

A.J. Fischer, K. Hertogs, B. Hatew-Chuko, and M.A. Steele¹

Department of Agricultural, Food, and Nutritional Science, University of Alberta, Edmonton, AB, T6G 2P5, Canada

¹Corresponding Author: Michael A. Steele. Telephone: +1(519) 400-6556. Fax: +1(780) 492-4265. E-mail: mastele@ualberta.ca

Oligosaccharides (OS) in bovine colostrum and milk have been shown to function as prebiotic substances for beneficial bacteria in the gut, inhibit pathogenic organisms, and also may enhance the uptake of IgG in the small intestine. The concentrations of oligosaccharides in bovine colostrum and mature milk are well-known, yet information regarding their concentrations during the transition from colostrum to mature milk is lacking. Therefore, the objective of this study was to characterize the OS profile during the first week of lactation in primiparous and multiparous Holstein dairy cattle. The experiment was conducted on a commercial dairy farm in Alberta, where 10 multiparous (n=10, MP) and 10 primiparous (n=10, PP) dairy cows were assigned to the study at the time of calving. The colostrum sample (milking 1) was taken within 12h after calving, followed by collection of milkings 2-6, 8, 10, 12 and 14. Samples were analyzed for concentrations of 3'sialyllactose (3'SL), 6'sialyllactose (6'SL), 3'sialyllactosamine (3'SLN), 6'sialyllactosamine (6'SLN) and disialyllactose (DSL) using a liquid chromatography-mass spectrometry system and for IgG concentrations using radial immunodiffusion. As expected, concentrations of IgG were highest ($P<0.0001$) in colostrum and milking 2 compared to all other milkings. Moreover, PP animals (82.1 ± 3.14 mg/ml) had lower ($P=0.03$) concentrations of IgG compared to MP animals (106.1 ± 16.18 mg/ml) in colostrum. In regards to OS concentrations, 3'SL, 6'SL and 6'SLN were higher ($P<0.01$) in colostrum and milking 2 compared to all other milkings, where as DSL was only different ($P<0.0001$) in colostrum. As expected, 3'SL was the most abundant ($P<0.0001$) OS in colostrum and milking 2 and 3'SLN was only detected in trace amounts. Interestingly, differences among parity were detected for 6'SLN in colostrum, with PP animals having lower concentrations ($P=0.08$, 61.3 ± 23.13 ug/ml vs. 127.1 ± 23.6 ug/ml) compared to MP animals. These findings demonstrate that feeding milking 2 (transition milk) to newborn calves may have significant benefits in establishing a healthy gut bacterial community and immune system in the newborn dairy calf.