Effects of the Pre-partum Administration of Melatonin on Concentrations of Immunoglobulin G in Bovine Colostrum

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Worldwide markets have been established for bovine colostrum products, mainly as dietary supplements for positive effects on human health and athletic performance. Seasonal-calving dairying systems in Australia are well suited to supplying these markets, and many Victorian farmers have taken the opportunity to increase their profitability by supplying colostrum for its main immunoglobulin, immunoglobulin G_1 (IgG_1). Results were equivocal from 2 smaller scale experiments that aimed to increase colostral IgG_1 by pre-partum treatment of cows with melatonin (Regulin©)(M.J. Auldist, unpublished results). In this larger experiment, our objective was to determine whether pre-partum administration of melatonin would increase the concentration of colostral IgG_1.

This study was conducted at DPI Ellinbank using 24 Holstein/Friesian dairy cows older than 2 years of age. Three weeks before their expected calving date, 12 cows had 6 melatonin slow-release implants administered subcutaneously behind the ear (3 in each ear). Each implant was designed to release 18 mg of melatonin over 1 month, resulting in a cumulative monthly dose of 108 mg/cow. The other 12 cows did not receive any treatment. For the first 5 days post-calving, all milk was collected to measure colostrum yield and the concentration of its IgG_1. Blood samples were also taken from each cow 10 days pre-partum and at calving to measure melatonin concentrations.

Ten days pre-partum and at calving the concentrations of melatonin in blood were significantly higher ($P < 0.05$) in treated cows (108 and 101 pM/L) compared with control cows (1 and 1 pM/L). Neither the yield of colostrum nor the concentration of IgG_1 in colostrum was different between treatments ($P > 0.05$). The concentration of IgG_1 on day 1 was 30 and 35 g/kg for the control and the treated cows, respectively, and had declined to 2 and 6 g/kg on day 2 (Figure 1). The yield of IgG_1 was not different ($P > 0.05$) between treatments at any stage.

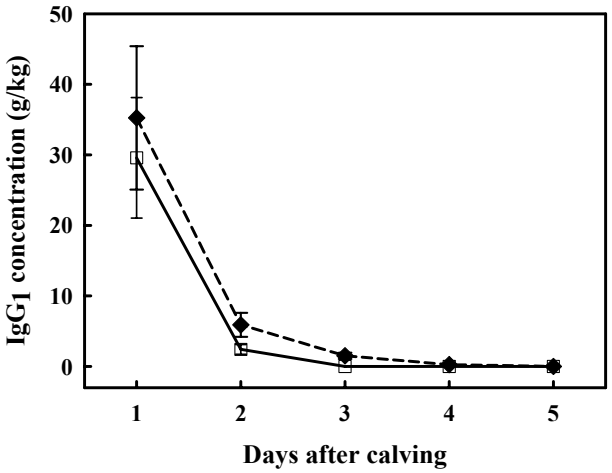

Figure 2. Concentrations of immunoglobulin G_1 (IgG_1) in the colostrum of cows treated with melatonin implants before calving (♦) and of those that were not treated (□). Error bars are standard errors about points.

The implantation and slow release of melatonin was successful since the pellets effectively elevated circulating blood concentrations of melatonin by 10 days pre-partum, and this was maintained through to calving. However, these elevated blood melatonin levels did not lead to increased concentrations or yields of IgG_1 in colostrum. The initial study, involving a small number of cows, demonstrated increases in concentration and yield of IgG_1, but this result was not supported in the second experiment or in the one reported here using greater numbers of animals. Since there seems to be no consistent increase in IgG_1 concentration or yield, we conclude there is probably no practical application or financial benefit to be obtained from using this technology.

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