

Effect of a melatonin implant on the circadian variation of plasma prolactin and rectal temperature in newborn sheep

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Abstract

Plasma prolactin and rectal temperature show a circadian rhythm in newborn sheep raised under continuous light. Melatonin lowers the concentration of plasma prolactin but it is not known if it affects its circadian rhythm. To detect whether melatonin acts on the circadian system we studied the effect of a subcutaneous melatonin implant in the circadian rhythms of prolactin and rectal temperature in newborn lambs raised under continuous light. We placed catheters in the pedal artery and vein in 9 newborn lambs (2-5 days of age). A subcutaneous melatonin implant was placed in 4 of the lambs at 9-12 days of age. Blood samples and rectal temperature measurements were obtained hourly for a period of 24 h, 11-15 days after the implant, at 20-27 days of age. To avoid interferences of heparin in our melatonin assay, serum melatonin concentration was measured before and during the implant in three additional newborns. Prolactin and melatonin were measured by RIA. Melatonin concentrations were 52.8 +/- 45.9 pg/ml (day) and 315.5 +/- 77.0 pg/ml (night) before treatment (SEM, P less than 0.001), and increased to 594.1 +/- 54.5 pg/ml after placing the implant (there was no difference in melatonin concentration between day and night during the time that the implant was in place). Melatonin had no effect on rectal temperature or its rhythm, but decreased basal plasma prolactin concentration (control: 97.5 +/- 11.3 ng/ml; treated: 25.1 +/- 2.4 ng/ml, P less than 0.001) and abolished the prolactin circadian rhythm, (Cosinor analysis): control: $\log \text{ prolactin (ng/ml)} = 1.8 + 0.26 \cos 15 (t - 11.16)$, $p = 0.05$; treated: $\log \text{ prolactin (ng/ml)} = 1.2 + 0.14 \cos 15 (t - 9.43)$, $P = 0.36$.