

# Estrous characteristics of dairy heifers treated at different stages of the estrous cycle with two prostaglandin formulations

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## Introduction

Prostaglandin (PG) F<sub>2</sub>α is commonly used to synchronize the estrus of dairy heifers, but its effectiveness is dependent on the phase of the estrous cycle (PEC) at treatment. Cloprostenol sodium (CLO) is a synthetic analogue of PGF<sub>2</sub>α, which may have differential effects on luteolysis and estrus behavior compared with natural PGF<sub>2</sub>α molecules [i.e. dinoprost tromethamine (DIN)]. We hypothesized that treatment of heifers in early diestrus (ED; 4 to 6 d) with CLO would improve estrous detection rate, shorten the interval from treatment to onset of estrous, and enhance estrous characteristics compared with DIN treatment.

## Materials and Methods

Holstein heifers (n = 1,019) were enrolled in the experiment at 11 months of age, when they were fitted with a collar containing a microphone and accelerometer (SCR Ltd., Netanya, Israel). The device recorded activity and rumination in 2 h intervals and determined the occurrence of estrous according to changes in activity and rumination. One month after enrollment, heifers were paired according to PEC [ED; mid-diestrus (MD) = 7 to 17 d; proestrus (PE) = 18 to 26 d] and assigned randomly to the PGF<sub>2</sub>α treatment (PGFTRT: CLO and DIN). Heifers were serviced (inseminated or embryo transferred 5 to 9 d after estrus) upon detected estrus and heifers not serviced were treated with PGF<sub>2</sub>α every 14 days until serviced using the same PGF<sub>2</sub>α formulation. Using the DataFlow2 (SCR Ltd., Netanya, Israel) software, estrous characteristics (onset, duration, activity peak, rumination nadir, and heat index) were recorded. A subgroup of heifers (n=80) had blood sampled on the day of PGF<sub>2</sub>α treatment and on the day of estrus to determine progesterone (P<sub>4</sub>) concentrations. Continuous variables were analyzed by ANOVA using the MIXED procedure. Binary variables were analyzed by logistic

regression using the LOGISTIC procedure. Hazard of estrus was analyzed by the Cox proportional hazard ratio using the PHREG procedure. A non-parametric procedure (Kruskal-Wallis) was used to analyze non-normally distributed data using the NPAR1WAY procedure. Statistical significance was considered at P<0.05 and tendency at 0.05

## Results

Within 7 days after the initial PGF<sub>2</sub>α treatment, percentage of heifers in estrus was (P<0.01) affected by the interaction between PEC and PGFTRT. Among ED heifers PGFTRT did not affect the percentage of heifers in estrus within 7 d of treatment (CLO = 40.7 vs DIN = 37.2%), but among MD and PE heifers CLO treatment increased the percentage of heifers in estrus compared with DIN (95.3 vs 86.2%; 66.7 vs 53.9%). Hazard of estrus detection was greater for CLO than DIN (AHR=1.36, 95%CI = 1.18-1.56; P<0.01) independent of PEC. Duration of estrus (P=0.88), interval from onset of estrus to peak activity (P=0.66), and rumination nadir on the day of estrus (P=0.82) were not affected by PGFTRT. Likelihood of heat index > 80 was (P=0.02) affected by PGF<sub>2</sub>α treatment. Progesterone concentration on the day of PGF<sub>2</sub>α treatment was not (P=0.27) different between CLO and DIN heifers. On the day of estrus, CLO heifers had (P<0.01) lower P<sub>4</sub> than DIN heifers (0.04 vs 0.11 ng/mL) and a larger (P<0.01) percentage of CLO heifers had P<sub>4</sub> < 0.009 ng/mL (81.0 vs 50.0%).

## Significance

Treatment of dairy heifers with CLO increased the hazard of estrus within 7 d after treatment and reduced P<sub>4</sub> concentration on the day of estrus compared with DIN treatment but it did not affect estrous behavior.