

## Administration of GnRH at Onset of Estrus, Determined by Automatic Activity Monitoring, to Improve Dairy Cow Fertility during the Summer and Autumn

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**Simple Summary:** We used an automatic activity-monitoring system to determine onset of estrus in dairy cows. Within 5 h of onset, we administered a single injection of GnRH analogue to improve fertility during the summer and autumn. The treatment increased pregnancy per insemination during the autumn, but not in the summer. The subgroups for which the treatment specifically tended to improve conception risk during the autumn were: mature (2nd plus parity) cows and cows with uterine disease and ketosis after calving. Detection of estrus onset by activity monitoring and GnRH administration shortly thereafter could be incorporated into a synchronization program, to improve fertility of positively-responding subpopulations of cows.

**Abstract:** We examined gonadotropin-releasing hormone (GnRH) administration at onset of estrus (OE), determined by automatic activity monitoring (AAM), to improve fertility of dairy cows during the summer and autumn. The study was performed on two dairy farms in Israel. The OE was determined by AAM recorded every 2 h, and a single im dose of GnRH analogue was administered shortly after OE. Pregnancy was determined by transrectal palpation, 40 to 45 d after artificial insemination (AI). Conception risk was analyzed by the GLIMMIX procedure of SAS. Brief visual observation of behavioral estrus indicated that about three-quarters of the events ( $n = 40$ ) of visually detected OE occurred within 6 h of AAM-detected OE. Accordingly, the GnRH analogue was administered within 5 h of AAM-detected OE, to overlap with the expected endogenous preovulatory LH surge. Overall, pregnancy per AI (P/AI) was monitored over the entire experimental period (summer and autumn) in 233 first, second or third AI (116 and 117 AI for treated and control groups, respectively). Least square means of P/AI for treated (45.8%) and control (39.4%) groups did not differ, but group-by-season interaction tended to differ ( $p = 0.07$ ), indicating no effect of treatment in the summer and a marked effect of GnRH treatment ( $n = 58$  AI) compared to controls ( $n = 59$  AI) on P/AI in the autumn (56.6% vs. 28.5%,  $p < 0.03$ ). During the autumn, GnRH-treated mature cows (second or more lactations), and postpartum cows exhibiting metabolic and uterine diseases, tended to have much larger P/AI than their control counterparts ( $p = 0.07$ – $0.08$ ). No effect of treatment was recorded in the autumn in first parity cows or in uninfected, healthy cows. In conclusion, administration of GnRH within 5 h of AAM-determined OE improved conception risk in cows during the autumn, particularly in those exhibiting uterine or metabolic diseases postpartum and in mature cows. Incorporation of the proposed GnRH treatment shortly after AAM-detected OE into a synchronization program is suggested, to improve fertility of positively responding subpopulations of cows.

**Keywords:** fertility; heat stress; disease; GnRH; estrus onset