OBSERVATIONAL VERSUS ELECTRONIC METHODS FOR THE DETECTION OF ESTRUS IN FARMED RED DEER HINDS

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Background. Artificial insemination has been widely used in farmed deer, however conception rates following AI remain variable. This variability in conception rates may be due to AI technique, species-specific responses to estrous synchronization protocols, and variations in the optimal timing for insemination. The ability to monitor estrus behavior, including duration and intensity of estrus, could increase AI conception rates in cervids and thus decrease variability by increasing the precision in which estrus and ovulation can be predicted. The HeatWatch™ (HW; DDX, Inc., Denver, CO) electronic estrus detection system has the ability to detect estrus and record the time and duration of individual mounts. The HW system has been used successfully in cattle, and could be a significant resource for deer farmers if the system can accurately detect estrus in red deer. Therefore, the objectives of this study were to examine the efficacy of the HeatWatch electronic estrus detection system for monitoring behavioral estrus in red deer hinds and, to determine whether estrous synchronization alters duration or intensity of estrus behavior and AI conception rates in red deer hinds.

Research Findings. The range from CIDR withdrawal to estrus was 29 to 91 hours, with a mean interval of 47.5 ± 3.3 hours (Table 1). There was no difference ($P>.10$) in time from CIDR removal to estrus between the yearling IE (43.17 ± 3.12 hr) and the mature IE hinds (49 ± 4.32 hr). Within 25 days on trial (the time in which hinds were housed with the three sterile stags), 41 hinds (82 %) were observed in estrus and bred by AI. The use of a CIDR followed by an injection of PMSG resulted in more red deer hinds detected in estrus; 96 % of IE hinds were observed in estrus and bred by AI ($P<.05$) compared to 68% of NE hinds. Although not significant ($P>.10$), the IE hinds had a higher pregnancy rate (41.6 %) than the NE hinds (29.4 %). However, in both treatment groups the yearling hinds had higher pregnancy rates (100 %; $P<.05$) than the mature hinds (IE: 22.2 %; NE: 14.3 %). There was a 46.7 % first service pregnancy rate among the hinds that returned to estrus in the presence of the clean-up stag, with no difference ($P>.10$) noted between the IE and NE treatment groups. The overall herd pregnancy rate (AI and clean-up stag) was 58%.

When the hinds were housed with the three young sterile stags all of the hinds that were bred by AI (n=41) were detected in estrus by visual appraisal of stag marks, while only 13 (31.7 %; $P<.001$) of those hinds observed were detected by HW (Table 2). However, when the hinds were housed with the mature clean-up stag 93.3 % of the hinds detected in estrus by visual

appraisal were also detected by HW. This suggests the success of HW in estrus detection may be affected by age (size) of the stag used for breeding. In both situations the top transmitter recorded more events (89.8 %; P<.001) than the bottom transmitter (10.2 %). There were no differences (P>.10) in number and duration of mounts with respect to treatment groups. However, there were differences (P<.05) in number and duration of mounts in relation to which stag they were housed with. When the hinds were housed with the three young stags, a lower number of mounts (1.83 ± .59) was recorded then when hinds were housed with the clean-up stag (4.54 ± .78). However, the duration of each mount was longer when the hinds were housed with the young stags (2.36 ± .56 sec) compared to the clean-up stag (1.46 ± .08 sec); although this difference in duration was under one second.

Table 1. Estrous Synchronization, artificial insemination and pregnancy rates for induced estrus (IE; CIDR + PMSG) and natural estrus (NE) red deer hinds.

Parameter	IE Hinds	NE Hinds
Hours from CIDR removal to observed estrus	47.5 ± 3.3	--
Percentage of hinds breds by AI	96%[a] (24/25)	68%[b] (17/25)
Pregnancy rate-AI	41.6% (10/24)	29.4% (5/17)
Pregnancy rate-clean up stage	50% (7/14)	43.8% (7/16)

Superscripts differ within IE and NE groups; ab = P<.05.

Table 2. HeatWatch and mounting behavior for red deer hinds housed with three young stags or with a mature clean-up stag.

	Young Sterile Stags	Mature Clean-up Stag
Hinds detected by HW	31.7 %[a] (13/41)	98 %[b] (28/30)
Top Patch (events)	17	124
Bottom Patch (events)	5	11
Number of Mounts	1.83 ± .59[a]	4.54 ± .78[b]
Duration of Mounts (sec)	2.36 ± .56[a]	1.46 ± .08[b]

Superscripts differ within row: ab=P<.05

Application. The use of a CIDR followed by an injection of PMSG (IE hinds) resulted in more red deer hinds to be detected in estrus. In addition, the IE hinds had a higher pregnancy rate than the NE hinds. These data suggest that the success of HW in estrus detection may be affected by age (size) of the stag used. In both situations the higher placement of the HW patch was more effective than the lower placement.