



Research Article

Volume 5 Issue 1 - January 2018
DOI: 10.19080/JDVS.2018.05.555653

Dairy and Vet Sci J

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Time of Insemination Relative to onset of Activity Threshold of Cow Manager ® is Associated with Pregnancy Risk When Using Gender Selected™ Semen for Jersey Cattle



Ray Nebel*

Department of animal reproduction, Select Sires Inc, USA

Submission: October 27, 2017; Published: January 25, 2018

*Corresponding author: Ray L Nebel, Department of animal reproduction, Select Sires Inc, USA, Tel: 614-315-4052; Email: rnebel@selectsires.com

Abstract

Data from several research studies over the last five years in dairy and beef cattle have indicated that insemination closer to the time of ovulation than with conventional semen may improve conception rates. Previous data indicated that insemination between 8 to 16 post activity thresholds (Select Detect) was ideal for use with conventional semen in lactating Holstein cows [1]. A recent study [2] indicated that the optimal timing of insemination using an activity system (SCR Engineers ltd., Netanya, Israel) occurred somewhere between 23 to 41 h after the reaching the activity threshold activity level in lactating Jersey cows. The current study was designed to determine the optimal time of insemination in Jersey cattle (cows and heifers) based on the onset of activity defined by the CowManager® system.

Materials and Methods

Data were collected in one herd (Bohnert Jerseys, East Moline, IL) across heifers (n=206) and cows (n=415) fitted with the CowManager® sensor (Agis Automatisering, Harmelen, Netherlands). Insemination was performed once daily (afternoon) independent of the onset of estrus (defined by achieving a threshold level of activity). Pregnancy was determined by rectal palpation 33 to 39 days post insemination. Conception rate was modeled separately for heifers and cows using mixed model ANOVA with a logit function for binary data (GLIMMIX procedure of SAS®) and included the following variables (effect type, age group): lactation number (fixed, cows), service number (fixed, cows and heifers), season (fixed, cows and heifers), category of activity onset to insemination (fixed, cows and heifers), days in milk (DIM; continuous, cows), and sire (random, cows and heifers). All two-way interactions were initially included in the model but removed if not significant (P>0.15). The conception rate curve was fit using the same model as above but the interval from activity onset to insemination was treated as a continuous variable included in the model as a quadratic function. All other data were analyzed with ANOVA using the GLM procedure of SAS.

Results

Conception rate (Table 1 & Figure 1) was significantly affected by DIM (P=0.08; slope = 0.425±0.25 % per DIM),

lactation number (1st or 2nd and greater, 45% vs. 33% respectively; P=0.03), and the onset of activity to insemination expressed as 0 to 8h, 8:01h to 16h, and greater than 16h (P< 0.01) in cows. Only service number (1st or 2nd and greater, 56% vs 29%, respectively; P = 0.002) affected conception rate in heifers (P < 0.01). The distribution of timing from the onset of activity to insemination is depicted in Figure 2. The onset of estrus by time of day is depicted in Figure 3. The duration of estrus (Table 2) was affected lactation (P < 0.01), season (P < 0.001), and the interaction of lactation and season (P = 0.06).

Table 1: Effect of time from onset of activity to insemination on conception rate (%).

Age group	0 to 8h	8 to 16h	16h +
Heifers	38±9 ^a	39±6 ^a	51±8 ^a
	(n = 37)	(n = 111)	(n = 58)
Cows	26±6 ^a	40±6 ^{ab}	51±7 ^b
	(n = 101)	(n = 206)	(n = 108)
1 st Lactation*	31±8	40±7	64±9
	(n = 52)	(n = 88)	(n = 36)
2 nd + Lactation*	22±7	39±7	38±7
	(n = 49)	(n = 118)	(n = 72)

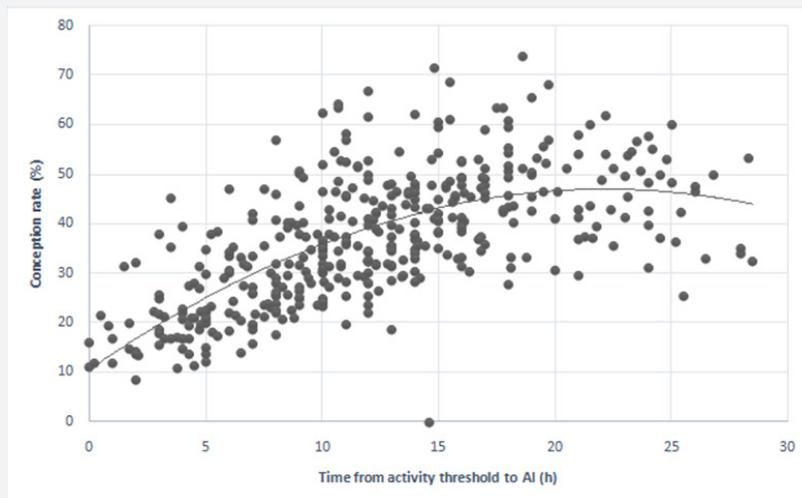


Figure 1: Association between interval from onset of activity (threshold for alert in CowManager®) to insemination and probability of pregnancy at 36±3d after insemination.

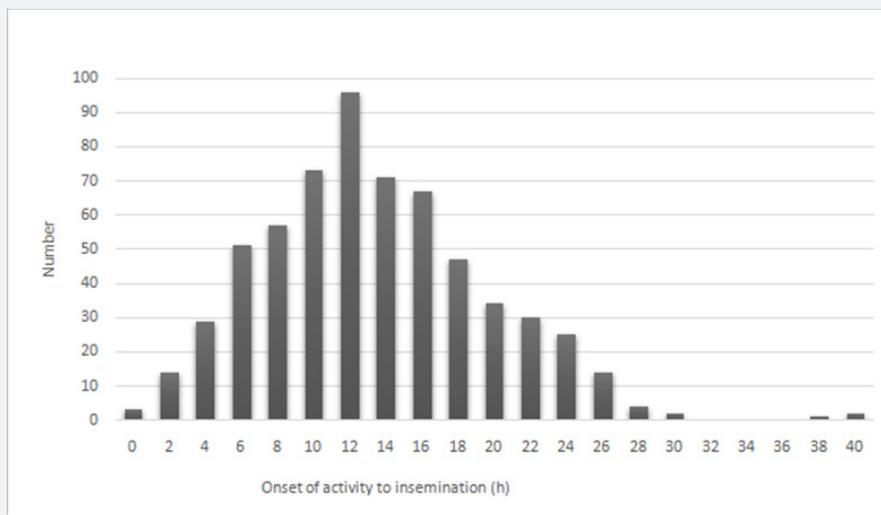


Figure 2: Distribution of the interval from reaching activity threshold determined by CowManager® system to insemination.

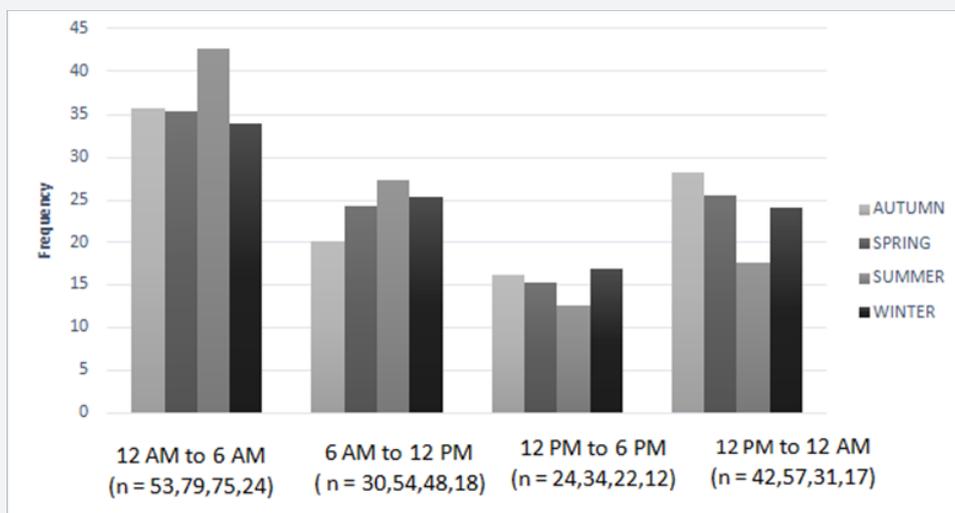


Figure 3: Distribution of onset of activity determined by CowManager® system by season.

Table 2: Duration of activity above the alert threshold determined by the CowManager® system.

Age Group	Season	Duration of Estrus (H)*
1 st Lactation	AUTUMN	11
	SPRING	12
	SUMMER	10
	WINTER	13
2 nd + Lactation	AUTUMN	13
	SPRING	16
	SUMMER	14
	WINTER	15
heifer	AUTUMN	13
	SPRING	14
	SUMMER	9
	WINTER	12

Conclusion

Inseminating 16+hours after the onset of activity defined by CowManager® resulted in a greater conception rate compared to breeding early (0 to 8 hours). Although there were no significant differences in conception rate between the 8-16 and 16+ hour timings, the heifer and cow data along with data from other studies suggest breeding 16 to 24h after the onset of activity should maximize conception rates when using sex-sorted semen.

References

1. Stevenson JS, Hill SL, Nebel RL, DeJarnette JM (2014) Ovulation timing and conception risk after automated activity monitoring in lactating dairy cows. *J Dairy Sci* 97: 1-13.
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DOI: [10.19080/JDVS.2018.05.555653](https://doi.org/10.19080/JDVS.2018.05.555653)

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