ANESTRUS IN LACTATING DAIRY COWS BEFORE OVULATION SYNCHRONIZATION

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Summary

The incidence of anestrus in dairy cattle prior to first inseminations carried out after a minimum of 60 days postpartum ranged from 4 to 58% in first-lactation cows and 14 to 50% in older cows. Dairy cows with more days in milk, older than 2 years, and in better body condition (probably reflective of greater postpartum dry matter intakes) were more likely to cycle than thinner cows. Cows that were not cycling before the first week of insemination conceived at lower rates and took longer to become pregnant.

(Key Words: Body Condition, Cows, Anestrus.)

Introduction

Most mammals naturally undergo a variable period of anestrus following parturition. This period is referred to as a lactational or postpartum anestrus. Various factors contribute to the duration of this period, including age or lactation number, dry matter intake, body condition, milking frequency, and overall health. The most prolonged intervals to normal postpartum ovarian activity and onset of estrous cycles are observed in suckled cows, because multiple suckling bouts and continued cow-calf interactions prevent reestablishment of necessary pituitary hormone secretions (i.e., luteinizing hormone) to support follicular maturation.

Most studies have indicated that cows milked twice daily generally ovulate for the first time after calving sometime between 15 and 30 days in milk. As frequency of milking increases, the interval to first ovulation may increase slightly, but in all cases, the interval to first estrus is more prolonged than the interval to first ovulation. A high percentage of cows fail to show any sexual behavior (estrus) prior to first ovulations, but nearly all cows display estrus by the third ovulation.

Because of the preceding knowledge about dairy cows, most have considered anestrus not to be a limiting factor in achieving pregnancies. However, in more recent times, where cows are milked 3× daily and bST is used nearly universally, cows are more likely to carry less body condition into the dry period. Therefore, the potential exists for cows to experience more prolonged periods of anestrus.

Nutrients are used by cows according to an established priority. The first priority is maintenance of essential body functions to preserve life. Once that maintenance requirement is met, remaining nutrients accommodate growth. Finally, lactation and the initiation of estrous cycles are supported. Because older cows have no growth requirement, nutrients are more likely to be available for milk synthesis and estrous cycle initiation. Because of this priority system, young, growing cows generally produce less milk and are anestrous longer after calving. As a consequence, one might expect these

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factors to influence the ability of the cows to initiate estrous cycles early after calving.

The objective of this collection of studies was to determine the incidence of anestrus in dairy cows prior to initiating various programmed breeding protocols that attempt to synchronize ovulation before first artificial inseminations.

Procedures

In the last 3 years, we have studied more than 1300 dairy cows on three dairy farms. As part of those studies, we have estimated the cycling status of these cows based on blood samples that were collected before synchronization of estrus, ovulation, or both. Blood samples were collected at least twice between 0 and 19 d before $PGF_{2\alpha}$ was administered on Monday of the insemination week and later assayed for concentrations of progesterone. This period corresponded to 40 to 83 days in milk when body scores also were measured (1 = thin and 5 = fat).

Cows were classified as anestrous when serum concentrations of progesterone were <1 ng/ml in all samples collected prior to the insemination week. If any one of several blood samples collected contained progesterone >1 ng/ml, these cows were considered to have initiated estrous cycles prior to the insemination week.

Results and Discussion

Table 1 summarizes the results of these studies. Two studies were conducted in non-summer months, and the third during a hot summer in Kansas (1998). One of these herds was milking 3× daily, and all herds' rolling DHI averages for milk exceeded 20,000 lb.

In the first study of 678 cows, the average percentage of cows cycling before timed AI (TAI) was 82% (Table 1). In the first-lactation, 2-year-old cows, cycling percentage was lower in one herd than in the second herd, whereas no difference in cycling percentages were detected between herds for older cows. Body condition scores assessed at time of blood sampling averaged 2.3. Cows in better body condition were more likely to be cycling than thinner cows. Cows with more days in milk at the blood-sampling times also were more likely to be cycling.

In the second study of 251 cows in one herd where cows were milked 3× daily, the percentage of cows cycling was less at 44% (Table 1). Again, body condition averaged about 2.3. Younger and thinner cows were less likely to be cycling. In fact, as body condition increased by 0.5 units, the percentage of cows cycling increased by 24%. Milk yield (150-d energy-corrected milk) had no influence on cycling percentages.

In the last study of 385 cows in three herds during the summer, the percentage of cows cycling was 84% (Table 1). In this study, lactation number did not affect cyclicity, but body condition (average of 2.4) was very important. For every 0.5 unit increase in body condition for cows in the study, cyclicity increased by 7.2%.

Subsequent first-service pregnancy rates (measured at days 27-29 after insemination) in dairy cows that were either cycling or anestrous prior to the insemination week are summarized in Table 2. In nearly every comparison, pregnancy rates were numerically less in those cows that were anestrous prior to insemination. The exceptions were those anestrous cows treated with progesterone (via an intravaginal progesterone-releasing device or CIDR-B) and anestrous cows treated with the Ovsynch protocol during the summer.

The important point learned from these studies was that cows not cycling by the end of the volunteer waiting period conceived at lesser rates and took longer to eventually get back in calf (data not shown). In each case, body condition was a very important predictor of when cows began estrous cycles after calving.

Table 1. Estimates of Cycling Status of Lactating Dairy Cows Producing More than 20,000 lb of Milk before the Onset of First AI

Season	Herd	No. of Cows	Days in Milk when Blood Sampling Occurred	Lactation Number 1	Lactation Number 2+
				----- % cycling -----	
Not summer	1	284	48-68	88	86
	2	394	40-60	72	87
Not summer	1	251	47-67	42	50
	1	66	63-83	96	85
Summer	2	198	57-77	83	87
	3	121	56-76	77	86

Table 2. First-Service Pregnancy Rates of Lactating Dairy Cows Based on Their Cycling Status Prior to First Insemination

Season	Treatments	Cycling Status: No	Cycling Status: Yes
		----- % pregnancy rates (no. of cows) -----	
Not summer[1]	Ovsynch	28 (54)	47 (36)
	Ovsynch + CIDR	62 (50)	54 (41)
	Ovsynch	22 (37)	36 (189)
Not summer[2]	PGF + Ovsynch	33 (47)	43 (186)
	2 × PGF	20 (44)	37 (197)
Summer[3]	Ovsynch	36 (31)	33 (176)
	Select Synch	13 (31)	19 (187)

[1]Ovsynch = injections of GnRH 7 days before and 48 hr after $PGF_{2\alpha}$. Ovsynch + CIDR (Ovsynch + a progesterone-releasing device placed in the vagina for 7 days beginning at the first GnRH injection and removed when $PGF_{2\alpha}$ was injected. In both cases, one AI was administered at 16 to 20 hr after the second GnRH injection.

[2]Ovsynch = as described above. PGF + Ovsynch = one injection of $PGF_{2\alpha}$ given 12 days before the Ovsynch protocol. 2 × PGF = injections of $PGF_{2\alpha}$ given 12 days apart and one injection of GnRH given 48 hr after the second $PGF_{2\alpha}$ injection. In all cases, one AI was administered at 16 to 20 hr after the second GnRH injection.

[3]Ovsynch = as described above. Select Synch = injection of GnRH 7 days before $PGF_{2\alpha}$ and cows inseminated after detected estrus.