OVARIAN CODITION OF HOLSTEIN DAIRY COWS BETWEEN 30 AND 90 DAYS POSTPARTUM IN THE MICROREGION OF UBERLÂNDIA, MG[1]

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ABSTRACT: Anestrous postpartum is a state of complete sexual inactivity without estrous manifestations and the return of ovarian activity in postpartum may be negatively affected by several factors, such as negative energy balance (NEB), loss of body condition score (BCS), season in which the calving occurs, nutritional deficiencies, dystocic calving, retained placenta, uterine infections and metabolic diseases. This study aimed to evaluate the effects of BCS and number of days in milk (DIM) on ovarian cyclicity of Holstein dairy cows. Ovarian conditions of 168 cows between 30 to 90 days in milk (DIM) were evaluated twice by ultrasonography with seven days of interval and cows were classified in four categories: ovaries with presence of small follicles (Category 1: up to 10 mm); ovaries with medium follicles (Category 2: 10 to 18 mm); ovaries with large follicles (Category 3: over 20 mm) and ovaries with presence of corpus luteum (CL) (Category 4). The cows classified in categories 1, 2 and 3 were considered in anestrous. Data were analyzed by logistic regression at Minitab ($P<0.05$). As a result 15 cows (8.93%) were in Category 1, 34 (20.24%) in Category 2, 4 (2.38%) in Category 3 and 115 (68.45%) in Category 4. There was no effect ($P>0.05$) of DIM in the percentage of cycling cows, however there was a tendency ($P=0.074$) that cows with greater BCS (≥ 2.75) had a higher cyclicity rate (74.44% vs. 61.54%) than cows with lower BCS. Days in milk effect was not detected in cyclicity rate in cows between 30 and 90 DIM, but there was a tendency of Holstein cows with greater body condition score to had higher cyclicity rate.

Keywords: anestrus, ovarian cyclicity, postpartum.

CONDIÇÃO OVARIANA DE VACAS LEITEIRAS HOLANDESAS ENTRE 30 E 90 DIAS PÓS-PARTO NA MICRORREGIÃO DE UBERLÂNDIA, MG

RESUMO: O anestro é um estado de completa inatividade sexual, sem manifestações de cio e o retorno à atividade ovariana no pós-parto pode ser afetado negativamente por diversos fatores, como o balanço energético negativo (BEN), perda de escore de condição corporal (ECC), estação do ano na qual ocorre o parto, deficiências nutricionais, ocorrência de distocia, retenção de placenta, infecções uterinas e doenças metabólicas. Objetivou-se avaliar os efeitos do ECC e do número de dias em lactação (DEL) sobre a ciclicidade ovariana de vacas leiteiras Holandesas. A condição ovariana de 168 vacas entre 30 e 90 dias em lactação (DEL) foi avaliada em dois exames de ultrassonografia com intervalo de sete dias, e as vacas foram classificadas em quatro categorias: ovários com presença de pequenos folículos (Categoria 1: até 10 mm); ovários com médios folículos (Categoria 2: 10 a 18 mm); ovários com grandes folículos (Categoria 3: acima de 20 mm) e ovários com presença de corpo lúteo (CL) (Categoria 4). As vacas classificadas nas

categorias 1, 2 e 3 foram consideradas em anestro. Os dados foram analisados por regressão logística usando o programa Minitab (P<0,05). Como resultado 15 vacas (8,93%) foram classificadas na Categoria 1, 34 (20,24%) na Categoria 2, 4 (2,38%) na Categoria 3 e 115 (68,45%) na Categoria 4. Não foi detectado efeito (P>0,05) de DEL sobre a porcentagem de vacas ciclando (com CL), porém houve uma tendência (P=0,074) das vacas com maior ECC (≥ 2,75) apresentarem maiores taxas de ciclicidade (74,44% vs. 61,54%) do que vacas com baixo ECC. Conclui-se que os dias em lactação não afetam a taxa de ciclicidade de vacas Holandesas, porém há uma tendência das vacas com melhor condição corporal apresentarem maiores taxas de ciclicidade.

Palavras-chave: anestro, ciclicidade ovariana, pós-parto.

INTRODUCTION

Anestrous is a state of complete sexual inactivity without signs of estrus. It is not a disease, but a symptom of temporary or permanent reduction in ovarian activity (Jainudeen and Hafez, 2004). The postpartum anestrous is a transition period during which the functionality of the hypothalamic-pituitary-ovarian-uterine axis recovers from last gestation. At least two to three weeks are required for uterine involution, where the stocks of the luteinizing hormone (LH) from anterior pituitary can be replenished, and the waves of follicular growth can be resumed by the ovaries. Thus, within three weeks of postpartum, the cow is ready to return to cyclicity (Yavas and Walton, 2000).

The moment of the return to cyclicity after parturition in female cattle is crucial to determine how early these cows will conceive and consequently set the calving interval (Sartori and Guardieiro, 2010). The return of ovarian activity in the postpartum period may be affected by several factors such as the severity and duration of negative energy balance (NEB), body condition score loss (BCS), the season in which calving occurs, nutritional deficiencies during transition period, dystocias, retained placenta, uterine infections and metabolic diseases.

Calving interval is directly reflected in the costs of production, once as calving interval extends, reduces the birth rate, with fewer dairy cows and greater number of "single" cows, decreasing reproductive efficiency and profitability production system (Lopes *et al*., 2009). According to Thatcher *et al.* (2006) the slow recovery of the reproductive competence during the postpartum period is the major limitation for success in reproductive programs. This study was conducted to evaluate the ovarian condition of Holstein dairy cows at the beginning of the breeding program and the effect of days in milk (DIM) and body condition score (BCS) on ovarian cyclicity.

MATERIALS AND METHODS

The experiment was conducted in a commercial dairy farm located at Uberlândia, Minas Gerais, Brazil. The farm had around 450 lactating Holstein cows milked three times a day, with an average of 18.75 kg of milk per cow per day. Cows were confined, receiving a properly balanced diet according to milk production, composed of corn silage, concentrates, mineral nucleus and *ad libitum* water. About 168 lactating cows, which were between 30 and 90 days post-partum were evaluated.

Reproductive management was performed with intervals of seven days in cows over 30 DIM using an ultrasound (MindrayDP-3300®) equipped with linear rectal transducer 7.5-MHz, to evaluate the characteristics of ovaries, such as the presence of corpus luteum (CL) and the diameter of the largest follicle in cows without CL.

The evaluation of follicular diameter was made through transrectal ultrasound with linear transducer to identify the images of follicles, performing lateral movements, looking for an image of larger diameter of the follicles. The images were taken and the average diameter of the largest follicle was measured using features of the device.

Ovarian condition was classified in four categories. Category 1: ovaries with small follicles (up to 10 mm in diameter); Category 2: ovaries with median follicles (10 to 20 mm in diameter); Category 3: ovaries with large follicles (over 20 mm in diameter) and Category 4: ovaries with CL. Cows of Category 4 were considered as cyclical, and cows from other categories (1, 2 and 3) as anestrous.

The BCS of the cows was evaluated according to the scale of 1 to 5 (1 - very thin to 5 - obese)

proposed by Edmonson *et al.* (1989). For analysis animals were divided into two groups: the first group of cows with BCS less than or equal to 2.50 and the second group of cows with BCS more than or equal 2.75. The cows were also subdivided into groups according to DIM, one group from 30 to 60 DIM and the other from 61 to 90 DIM.

Postpartum cyclicity incidence was evaluated using logistic regression, DIM and BCS effects being included in the model, using the Minitab. Statistical significance was defined as $P \leq 0.05$ and statistical tendencies as $0.05 < P \leq 0.10$.

RESULTS AND DISCUSSION

Among the 168 cows evaluated, 15 had (8.93%) small follicles (Category 1); 34 (20.24%) had medium follicles (Category 2); 4 (2.38%) had large follicles (Category 3) and 115 (68.45%) with CL (Category 4) (Table 1).

A study by Souto *et al.* (2009) which evaluated 50 female crossbred Holstein x Gir cows, classified them according to ovarian condition in four categories similar to those described in the present study, with results of 12% (6/50) in Category 1, 52% (26/50) in Category 2, 18% (9/50) in Category 3 and 18% (9/50) in Category 4. However, these results differ from those found in the present study, since a higher percentage of cows (68.45%) classified in Category 4 was observed, due to the long period of drought occurred during the experiment, which interfered in the supply of females, a condition very different from that found in the present study.

In another study, Holstein cows were likewise classified according to ovarian structures detected by ultrasound and serum progesterone. As a result 4.83% (20/414) anestrus cows were found having few follicles of over 10 mm and low progesterone concentrations; 5.79% (24/414) cows with luteal and follicular cysts, classification confirmed by progesterone concentration and 83.09% (344/414) cyclic females (Stevenson and Tiffany, 2004). This study also showed that most animals had already returned to ovarian cyclicity at the beginning of the breeding program.

An experiment using 333 Holstein cows during the seventh postpartum week, presented 74.5% (248/333) of cyclic cows and 9.3% (31/333) of cystic cows (Santos *et al.*, 2009). The percentage of cows with follicles greater than 20 mm (Category 3) was 2.38%, which suggests that the occurrence of follicular cysts cannot be considered as a specific problem for the herd analyzed in this study.

In an extensive review by Wiltbank *et al.* (2002) on anestrous in cattle, four possible anovulatory conditions were discussed. The probable cause of anovulation occurrence with follicular growth only up to emergency phase (follicles with ± 4mm) would be a possible deficiency of follicle stimulating hormone (FSH). However, the anovulatory condition with follicular growth until divergence phase (follicles with ± 9mm) is common in postpartum dairy cows during NEB, causing an estradiol inhibitory activity on the secretion of gonadotropin-releasing hormone (GnRH) and affecting LH pulsatility. Anovulation with follicular growth up to ovulation size or greater (follicles 10 to 20mm or more) characterizes the occurrence of follicular cysts in which high estradiol blood levels are not sufficient to cause the LH surge that is responsible for ovulation. Finally, the anovulatory condition with luteal tissue in at least one of the ovaries indicates that any uterine abnormality, such as uterine infection or failures in involution, can reduce prostaglandins secretion (PGF) or transportation of this substance to the ovary, prolonging CL lifespan.

There was no DIM effect on percentage of cyclic cows, but there was a tendency ($P = 0.074$) for cows with BCS ≥ 2.75 to have a higher cyclicity rate (Table 2).

Table 1. Ovarian classification according to days in milk (DIM) and body condition score (BCS) in Holstein dairy cows, Minas Gerais, Brazil

Variables		Ovarian Classification			
		Category 1 Small Follicle	Category 2 Medium Follicle	Category 3 Large Follicle	Category 4 Presence of CL
DIM	30 – 60	7,5% (10/133)	22,55% (30/133)	2,25% (3/133)	67,7% (90/133)
	61 – 90	14,3% (5/35)	11,42% (4/35)	2,85% (1/35)	71,43% (25/35)
BCS	≤ 2,50	11,54% (9/78)	21,8% (17/78)	5,12% (4/78)	61,54% (48/78)
	≥ 2,75	6,7% (6/90)	18,9% (17/90)	0% (0/90)	74,4% (67/90)

Table 2. Percentage of cyclic Holstein cows according to days in milk (DIM) and body condition score (BCS), Minas Gerais, Brazil

Variables		Percentage of cyclic cows (%)	P value
DIM	30 - 60	67.67%	0.670
	61 - 90	71.43%	
BCS	≤ 2.5	61.54%	0.074
	≥ 2.75	74.44%	

The average interval of postpartum cyclicity in dairy cows is about 24 days (Royal *et al.*, 2000), although it is quite common to identify cows which have not returned to cyclicity up to 100 days postpartum (Mann, 2011). This study shows 67.67% of cycling cows with DIM between 30 and 60 and 71.43% between 61 and 90 DIM, which indicates that there was no significant difference in the percentage of cyclic cows related to DIM, probably because the postpartum management of the cows was effective at this farm.

Using progesterone doses from skim milk samples, collected between the second and 11th week postpartum, associated with rectal palpation, Shrestha *et al.* (2004) observed 37% (20/54) of cows with normal return to ovarian cyclicity followed by regular estrous cycles in less than 45 DIM, and 63% of cows delayed in returning to cyclic activity, whose regular cycles were not detected before 45 DIM.

There was no DIM effect on ovarian condition of cows at the beginning of the breeding program, but it was detected a tendency (P = 0.074) in those cows that had greater BCS to have higher cyclicity rate. Santos *et al.* (2004) compared the return of ovarian cyclicity in postpartum crossbred Holstein x Gir and Holstein and Nelore, concluded that higher the cyclicity rate, greater the BCS of the cows, which is consistent with this reference study.

CONCLUSIONS

Days in milk effect was not detected in cyclicity rate in cows between 30 and 90 DIM, but there is a tendency of Holstein cows with greater body condition score to have higher cyclicity rate.

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