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POST-PARTUM OVARIAN ACTIVITY IN CONCEIVED AND NON-CONCEIVED FRIESIAN COWS DURING SUMMER SEASON IN EGYPT

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SUMMARY

A total of thirty lactating Friesian cows were used to descript the post-partum ovarian activity during the first 120 days post-partum to identify the physiological reasons of conception failure of cows those were being calved during the hot season (May to August). Ovarian activity was monitored by weekly rectal palpation, and progesterone (P_4) concentration which was monitored in blood serum twice weekly. The interval from parturition to first ovulation (PPOI) as well as ovarian cycle length, ovarian activity parameters (number of total ovulation, ovulatory estrus, quiet ovulation and non-ovulatory estrus cases/cow) and ovarian functional disorder (long anestrous period, percentage of quiet ovulation, non-ovulatory estrus, cystic follicles, persistent CL and cessation of the ovulation) were determined.

Sustained anestrous cases were observed in 10% of animals during the experimental period. Remaining cows were divided into two classes, conceived (G_1, 51.9%) and non-conceived cows (G_2.48.1%). The length of the anestrous periods in G_2 was ($p<0.05$) longer than in G_1. G_1 had ($P<0.05$) higher frequency distribution percentage of transient P_4 rise before the first ovulation post partum than that in G_2. Progesterone profile characteristics during ovarian cycle prior the conception were ($P<0.05$) higher in G_1 than those in the ovarian cycles during the post partum period in G_2. The length of the anestrous periods in G_2 was ($p<0.05$) longer than in G_1. G_1 had the lowest percentages of quiet ovulation, cystic follicles and false estrus than G_2 while the persistent CL and cessation of the ovulation cases were observed only in G_2

Keywords: Cattle, post-partum, ovarian activity, progesterone

INTRODUCTION

To achieve a regular calving interval (every 12-13 months) conception has to be occurred achieved as early as they display their first ovulation. Majority of dairy cattle resume their ovarian activity within 30 days post-partum (Shipka, 2000). However, 11-46% of cows showed ovarian dysfunction during the post-partum period (Zduczyk *et al*., 1992; Stagnaro *et al*., 1994; Opsomer *et al*., 1998 and Rekwot *et al*., 2000).

Persistency of corpus luteum (2-20%,Stagnaro *et al.,*1994 and Opsomer *et al.,*1998) , long post-partum anestrous period (20-44%, Dawuda *et al.,* 1989; Byongkyu *et al.,* 1994 and Opsomer *et al.,* 1998). and sustained anestrous (3-5% of cows; Stagnaro *et al.* 1994; Swiefy 1997 and Opsomer *et al.,* 1998), are common forms of ovarian disorders in cattle.

The first post-partum ovulation is usually accompanied by feeble signs of estrus (Kamimura *et al.,* 1994). Silent ovulation occurred in range of 11% to 62% throughout the 70 to 120 days post-partum (Dawuda, *et al.,* 1989; Shipka, 2000). Moreover, Schopper *et al.* (1989) and Stagnaro *et al.* (1994) reported that false estrus case were 6.1% and 14% respectively.

Short ovarian cycles occurs in 6-72% during post partum period (Keeling *et al.,* 1992; Stagnaro *et al.,* 1994; Ghash *et al.,* 1996 and Rekwot *et al.*, 2000).

This study was planned to describe types of ovarian activity during the first 120 days post-partum in conceived and non-conceived Friesian cows which calved during summer season under Egyptian conditions.

MATERIALS AND METHODS

Animals and Management:

Thirty purebred multiparous Friesian cows (between 2nd and 5th parities) belonging to Sakha Animal Production Research Station, Agriculture Research Center, Ministry of Agriculture, Egypt (located in north eastern part of Nile Delta, Kafr El-Sheikh Governorate) were used in this study. Animals were calved throughout the period from May to August. After calving, cows were allowed to nurse their calves for four days before being machine milked; twice daily at 7.00 and 16.00 hr. Animals were housed loosely in semi-shaded open yards throughout the experimental period (till day120 post-partum).

According to live body weight and milk production level, the nutrition requirements were determined for the experimental cows. Cows were fed on concentrate mixture and rice straw until the end of the experimental period. Clean drinking water was made available all the day time for drinking.

Cows were checked for heat twice daily at 8.00 and 17:00 hr. using a vasectomized teaser. The teaser was allowed to run with the cows for 30 minutes at each check round. Standing behaviour was considered to be the main sign of heat. The reproductive tract was palpated once weekly to determine the time of uterine involution. Cows that displayed estrus at 45 days post-partum were artificially inseminated. Pregnancy was diagnosed by rectal palpation 60 days after insemination.

Blood Samples:

Blood samples were collected via the jugular vein twice weekly (3 to 4 days interval) to determine concentration of progesterone for monitoring ovarian activity. Samples were collected starting the first week post-partum till the end of the experiment. Samples (5ml) were centrifuged at 3000 rpm for 15 min. for serum separation. Serum samples were stored at -20°C till the assay time. Direct radioimmunoassay technique (RIA) was performed using ready antibody coated tube kits (Specto Orion Diagnostics, Espoo, Finland). According to the manufacturer's information, the cross reaction of progesterone antibody (at approximately 40-60% displacement) was 100% with progesterone, while it was less than 1% other steroids, The standard curve ranged between 0.0 and 31.0 ng/ml, and the sensitivity value of method was approximately 0.06-0.09 ng/ml. The intra and inter assay coefficients of variation were 7.9% and 8.1% respectively.

Experimental groups:

Cows were divided into two groups according to results of conception during the experimental period (120 days post-partum).The first group included the cows which conceived (G1) and the second one included the non conceived cows (G2). Groups were assigned to be similar in age (52-94 months), body weight (average 505.2±10.3 kg), parity (2-5) and preceding lactation (average 2980±107 kg).

Reproductive Parameters:

The intervals from parturition to first ovulation (PPOI), first detected estrus (PPEI) and number of ovulation per cow during the experimental period were recorded. According to the individual concentration of progesterone in serum, the complete ovarian cycles were divided according to their length into short (< 18 days), normal (18 – 24 days) and long cycle (≥25 days). Quiet ovulation (ovulation without any signs of estrus) was also determined. In quiet cases day of ovulation was estimated by serum progesterone concentrations. Ovulation was considered to have occurred when progesterone level was sustained at the level of ≥ 1.0 ng/ml for at least two consecutive samples. In ovulatory estrus, ovulation date was considered as the day of estrus if estrus was followed by an increase in progesterone concentration within at next 7 days. Estrus was considered to be false when cow exhibited estrous behaviour signs but progesterone concentration remained on its basal level (<1.0 ng/ml) throughout the next 7 days.

The cow was considered having long post-partum anestrous period when not increase in progesterone level and or no palpable ovarian structures were detected for more than 60 days post-partum. If this case continued throughout the studied period, the cows were considered to have a sustained anestrous. If a certain CL remained in one location for ≥ 4 weeks, the cow was considered to have a persistent CL. When a fully developed large follicle remained persistent without rupture for 10 days or more, the cow was considered as having a cystic follicle. Cow was considered having irregular ovarian activity when the ovarian cycles were spelt with period of anestrous or cessation of ovulation after regression of CL at least for ≥ 3 weeks.

Statistical analysis

Data were analyzed using one way analysis procedure of SAS liner program (1995), Model included one factor, incidence of conception. Duncan's new multiple range test (Duncan, 1959) was used for the multiple comparison of the means. Chi square was used to test the significance of the percentages

RESULTS AND DISCUSSION

The percentage of the conceived (G1) and non-conceived cows (G2) during the experimental period was 51.9% and 48.1%, respectively (Table 1). The depression of the number of conceived cows in this study may be attributed to limitation of the experimental period (120 days post-partum) and/or this study was carried out during the summer which characterized with low conception rate (Eicker *et al*., 1996).

Post-partum anestrous period

During the experimental period 90 % of experimental cows had post – partum anestrous period ranging between 21 and 101 days with an average of 45.5 ± 3.7

days. Progesterone concentration throughout this period averaged 0.3 ± 0.03 ng/ ml . Anestrous period was insignificantly shorter (P<0.05) in G1 than G2 (Table 1), while average of progesterone concentration throughout the anestrous period was similar (Table 1). The overall mean of post-partum anestrous period is in agreement with the averages previously reported on Friesian cows in Egypt (Kadoom, 1991 and Swiefy *et al*., 2001), the basal level of progesterone during post-partum anestrous period determined is in accordance with the previous report of Vetez and Randel (1993) and Swiefy (1997).

Table 1. The post-partum ovarian activity in conceived (G1) and non conceived (G2) Friesian Cows (mean ± SE) during the first 120 days post-partum

Items	G_1	G_2	Overall means
Number of cows (%)	14 (51.9)	13 (48.1)	27 (100)
Anestrous Period:			
Length (day)	43.6±8.8[a]	54.7±9.1[a]	45.6±3.7
Average P_4 concentration (ng/ml)	0.3±0.03[a]	0.3±0.03[a]	0.3±0.03
Transient P_4 rise before first ovulation.			
Number of cows	10	5	15
Frequency distribution (%)	71.4[a]	38.5[b]	55.6
Days before first ovulation (days)	8.9±1.8[a]	9.2±2.6[a]	9.0±1.1
Average P_4 level(ng/ml)	1.0±0.1	1.0±0.1	1.0±0.1
Ovulation Parameters			
No. of ovulation cases/cow	2.4±0.3[a]	3.1±0.3[a]	2.6±0.2
No. of ovulatory estrus cases/cow	1.8±0.2[a]	1.6±0.4[a]	1.7±0.2
No. of quiet ovulation cases/cow	0.4±0.2[a]	1.4±0.2[b]	0.9±0.2
No. of false estrus cases/cow	0.07±0.06[a]	0.3±0.3[b]	0.18±0.07

[A,b.]: means in the same row with different superscript, different significantly (P<0.05)

In 15 animals (55.6%) a temporary elevations of progesterone was observed 9.0±1.1 days before first ovulation with concentration of 1.0 ± 0.1 ng/ml. The transient rise in progesterone concentration before the first post–partum ovulation in the present study is similar to that reported by Vetez and Randel (1993), Weath *et al*. (1996) and Swiefy (1997). Occurrence of the transient progesterone rise before the first post – partum ovulation was observed in G1 with higher percentage than the other group (Table 1), while period between the transient progesterone rise and the post – partum first ovulation was almost similar in the two groups. Furthermore the same trend was observed in the average progesterone concentration (1.0 ± 0.1 ng /ml in each group)

In other three cows (10%) the anestrous period extended for the whole experimental period. The incidence of sustained post – partum anestrous percentage throughout the course of the experimental period (120 days post-partum) is longer than that of Swiefy (1997) who stated that the values ranged from 3% to 5.3%. This sustained anestrous could be attributed to the adverse effects of the environmental conditions on the hypothalams-hypophyseal-gonadal axis.

Ovarian activity:

Although number of ovulations / cow was higher in G2, number of ovulatory estrus / cow was almost the same in the two groups. While average of quiet ovulation cases / cow, false estrus cases /cow and the number of ovarian cycles/cow were lower ($P<0.05$) in G1 than G2 (Table1).

Ovarian dysfunction:

Nine out of twenty seven cows had long anestrous period with an average of 68.5±5.1 days. The percentage of cows which exhibited long anestrous cases was higher G2 than in G1. Quiet ovulation cases during the experimental period were higher in G2 than G1. G2 group had significantly greater percentage false estrus cases than it in G1 (Table 1). Quiet ovulation incidence at the first ovulation (59.3%, table 2) is in agreement with Donkin (1980) who reporting (about 64%) while Shipka *et al*. (2000) reported higher percentage (94.7%). The quiet ovulation cases may be attributed to the common practices of heat detection (two times daily) which would lead to misdetection of many estrus cases particularly for those begun and terminated at night (Swiefy , 1997).

A single case of cystic follicle was observed in G1 while two cases were observed in the other group G2. Two cases of persisted corpus luteum and four cases of cessation of ovulation were detected only in non conceived group (Table 2).

Table 2. The frequency distribution (%) of post-partum ovarian dysfunction types in conceived (G1) and non conceived (G2) Friesian Cows during the first 120 days post- partum

Items	G_1	G_2	Overall %
Long anestrous period	21.4	46.1	33.3
Quiet ovulation:			
At the first ovulation	50	69.2	59.3
At the experimental period	18.2^a	49.2^b	33.3
False estrus	7.1^a	38.5^b	22.2
Cystic follicles	7.1	15.4	11.1
Persistent CL	0.0	15.4	7.4
Cessation of the ovulation	0.0^a	30.8^b	14.8

^{A,b}: means in the row with different superscript, different significantly ($P<0.05$)

Ovarian cycles:

Only 21 out of 30 studied cows (70%) had one or more complete ovarian cycle (average 2.2 ± 0.3 cycles /cow) during the experimental period. The overall means of ovarian cycle length was 21.1 ± 0.8 days. The equality of mean length of ovarian cycles in the two experimental groups (Table 3) was earlier reported by the Ghash *et al*.(1996) who found the mean length of ovarian cycle in repeat breeder and normal cows were 20.6 and 20.4 days, respectively.

The progesterone profile characteristics of the preconception ovarian cycle in G1 and the ovarian cycle throughout the experimental period in G2 shows that 81.8% and 57.1% of ovarian cycle in G1 and G2 respectively were normal ovarian cycles. The period lapsed for progesterone to reach a level of 1.0 ng /ml was little lower in G1 than G2. The maximum progesterone level was attained after 11.5 ±1.0 and 12.5

±0.6 days of estrous cycle in G1 and G2, respectively, with significantly high maximum progesterone value in G1. Therefore, the area under the progesterone curve during complete cycles was significantly high in cycles before conception in G1 comparing with cycles during post partum period in G2 (Table3).

Table 3. Progesterone profile characteristics (MEAN± SE)of the pre-conceived ovarian cycle in conceived cows (G1) and the ovarian cycles during the first 120 days post-partum in non conceived cows (G2)

Items	G_1	G_2	Overall means
Number of cycles	11	28	39
Cycle length (days)	20.7±1.6	21.6±1.0	21.4±0.8
Number of cycle/cow	1.6±0.3[a]	2.8±0.3[b]	2.7±0.3
Length of ovarian cycle	20.2±0.9[a]	21.6±1.1[a]	21.1±0.8
Days to reach max P_4 level	11.5±1.0	12.5±0.6	12.2±0.5
Max value of P_4 level (ng/ml)	6.3±0.6[a]	3.4±0.4[b]	4.2±0.4
Area under P_4 curve (arbitrary units of cm^2)	9.3±1.3[a]	6.1±0.8[b]	7.0±0.7
Ovarian cycle types.(%) percentage			
Short cycle	1 (9.1)	7 (25)	8 (20.5)
Normal cycle	9 (81.8)	16 (57.1)	25 (64.1)
Long cycle	1 (9.1)	5 (17.9)	6 (15.4)

[A,b]: means in the row with different superscript, different significantly ($P < 0.05$)

The physiological reason (s) of conception failure in studied non conceived cows is most probably due to : (i) the low percentage of cows which had transient progesterone rise before the first ovulation post – partum (G2,38.5%) compared with conceived cows (G1,71.4%, table 1) may result in decrease of pregnancy maintenance because this progesterone rise may play an important role in the initiation of ovarian cycles (Peters and Lamming, 1984) and may have a role in preparation of the cow's reproductive tract for pregnancy (Weath *et al*., 1996). (ii) Reduction of progesterone profile characteristics of non conceived ovarian cycles than pre conception ovarian cycle in conceived cows (table 3) may effectively result in starvation of the conceptuses which may cause early embryonic mortality (Royal *et al*.2000), Therefore, the incidence of long ovarian cycle observed in non conceived cows was higher (table 3) which indicates that pregnancy may have been occurred but the embryo failed to survive during early stage of pregnancy (Peters, 1996). Furthermore, Kerbrot and Disenhous, (2000) reported that animals with a normal progesterone profile had a shorter interval to first insemination and higher conception rate than abnormal once . (iii) non-conceived cows (G2) compared with the conceived ones (G1) had significantly higher false estrus cases/ cow (0.3±0.2 vs. 0.07±0.06, respectively) and quiet ovulation cases / cow (1.4±0.2 vs. 0.4±0.2, respectively), in the first case the cow was served without incidence of ovulation, while in the other case, the number of ovulation which not accompanied with insemination was higher. (iv) The incidence of short ovarian cycles in non-conceived cows (table 3) is considered as one of the major problems which leading to lowered fertility (Rekwot *et al*. 2000) furthermore, cessation of ovarian activity in non

conceived cows (table 2) may cause the decrease of conception rate (Nakao *et al*. 1992).

The present findings indicate that animals with a normal ovarian activity had a shorter interval to first insemination and higher conception rat than abnormal one.

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النشاط المبيضى بعد الولادة فى أبقار الفريزيان فى فصل الصيف فى مصر

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استخدم في هذه التجربة ثلاثين بقرة فريزيان حلاب لوصف النشاط المبيضى بعد الولادة أثناء الفترة ١٢٠ يوم التالية للولادة للتعرف على الأسباب الفسيولوجية لفشل الإخصاب فى الأبقار التى تم تلقيحها خلال موسم الصيف فى مصر

تم التعرف على النشاط المبيضى من خلال إجراء الجس المستقيمى وقياس تركيز هرمون البروجيستيرون بالدم مرتين أسبوعيا

تم قياس الفترة بين الولادة واول تبويض وكذلك تم قياس طول الدورة المبيضية الواحدة والنشاط المبيضى بها بقياس كل من (عدد البويضات الكلى ، الشياع المصاحب للتبويض ، الشياع الصامت ، الشياع الغير مصاحب للتبويض لكل بقرة) وكذلك تم تقدير الحالات التى بها فشل وظيفى بالمبيض (فترة قبل شبق طويلة، نسبة التبويض الصامت ، نسبة الشياع بدون تبويض ، البويضات المتحوصلة ، الأجسام الصفراء الثابتة.

تم ملاحظة حدوث حالات اللاشبق فى ١٠% من الحيوانات إثناء فترة التجربة ، الأبقار المتبقية تم تقسيمها الي مجموعتين حسب حدوث الإخصاب وهما : المجموعة الأولى وهى الحيوانات المخصبة (٥١٠٩%) المجموعة الثانية الغير مخصبة (٤٨%).

كانت طول فترة اللاشبق فى المجموعة الثانية أكثر من المجموعة الأولى. كما ظهر توزيع تكراري عالي فى نسبة ظهور هرمون البروجيستيرون قبل التبويض الأول بعد الولادة فى المجموعة الأولى اكثر من المجموعة الثانية. كما لوحظ أيضا أن مستوي هرمون البروجيستيرون أثناء الدورات المبيضية فى المجموعة الأولى اعلى من المجموعة الثانية.

وكان من الملاحظ أيضا أن طول فترة الشبق فى المجموعة الثانية أطول من المجموعة الأولى حيث تميزت المجموعة الأولى بوجود نسبة اقل فى التبويض الصامت ووجود نسبة اقل فى الحويصلات المتكيسة وحدوث الشياع بدون تبويض عن المجموعة الثانية كما ظهرت الأجسام الصفراء المستديمة وحالات التبويض التأخر فى المجموعة الثانية فقط.