

EFFECT OF RETAINED PLACENTA ON POST-PARTUM REPRODUCTIVE PERFORMANCE OF FRIESIAN COWS

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SUMMARY

The present work was carried out during the period from March to October to study the effect of retained placenta on the post-partum reproductive performance in Friesian cows.

According to the incidence of retained placenta, twenty cows were divided into two equal groups ($n = 10$), normal cows (G_1) and cows with retained placenta (G_2). The interval from parturition to complete uterine involution (PPUP), first ovulation (PPOI), first estrus (PPEI), first service (PPSI) as well as service period (SP), number of services per conception (NS/C) and days open (DO) were determined.

The results showed that normal cows compared to retained placenta cows had significantly ($P < 0.05$) shorter PPUI, PPOI, PPEI, SP and DO. while PPSI was insignificantly shorter in normal cows. However, the number of services per conception and incidence of quiet ovulation throughout the 80 days post-partum was similar in the two experimental groups.

Keywords: Retained placenta, post-partum, Friesian cows

INTRODUCTION

Loss of the placenta in the cow occurs during the third stage of parturition, the process of separation usually takes less than six hours (Hafez, 1993 and Laven and Peters, 1996). Thus, the placenta is normally retained until after the birth of the calf and pathologically retained placenta is difficult to define. The time scaler used range from 6 to 71 hours (Van Werven *et al.*, 1992). The most commonly used definition is the presence of fetal membranes 74 hours or more post-partum (Laven and Peters, 1996), but retention for more than six hours is probably a better definition, particularly in older cows (Van Werven *et al.*, 1992).

Retained placenta is associated with delayed involution of uterus (Hafez, 1993 and Peters and Ball, 1995), an increase in days to first ovarian cycle (Schindler *et al.*, 1991), days to estrus (Simerl *et al.*, 1992 and Mellado and Reyes, 1994), days to first service (Oltenacu *et al.*, 1990, Kaneko, *et al.*, 1997, Emanuelson and Oltenacu, 1998 and Fourichon *et al.*, 2000), Service period (Oltenacu *et al.*, 1990), days open (Mellado *et al.*, 1994, Kaneko *et al.*, 1997 and Fourichon *et al.*, 2000) and more services per conception (Mellado *et al.*, 1994 and Kaneko *et al.*, 1997).

Retained placenta is one of the commonest cases occurring during the post-partum period. The condition is thought to reduce fertility in two ways, first by a direct effect which varies widely from one study to another. Erb *et al.* (1981) and Borsberry and Dobson (1989) have found that uncomplicated retained placenta can lead to an increase in calving interval. However, other studies have shown no direct effect of the condition on fertility (Sandals *et al.*, 1979), and Secondly by an indirect effect where there is a very close association between retained placenta and metritis (Hafez, 1993, Laven and Peters, 1996 and Bearden and Fuquay, 1997). This increase in metritis incidence is thought to be the major route by which the condition affects fertility.

The objective of this study was to evaluate the effect of retained placenta on the reproductive performance and ovarian activity during the post-partum period.

MATERIALS AND METHODS

The present work was carried out at Sakha Experimental Station, Animal Production Research Institute, Ministry of Agriculture and Land Reclamation. The experiment started seven days post-partum on March and extended for six months post-partum. A total of twenty purebred multiparous Friesian cows which calved during March 1999 were assigned into two equal groups (n = 10) according to the incidence of retained placenta. The first group (G₁) included the normal cows (which expelled their fetal membranes just after calving), while the second one (G₂) involved retained placenta cows (which expelled their fetal membranes by 24 hours or more post-partum). Cows in the experimental groups were nearly similar in parity, age, and weight at calving and preceding milk yield. The difference between the experimental groups in these traits was not significant (Table 1).

Table 1. Average (\pm SE) of parity, age, body weight at calving and milk yield in the two experimental groups

Items	G ₁	G ₂
Parity	2.6 \pm 0.3	2.6 \pm 0.2
Age (month)	73.75 \pm 5.8	75.98 \pm 6.1
Body weight (kg)	494.5 \pm 10.5	505.5 \pm 11.2
Milk yield (kg)	2629 \pm 320.3	2670.6 \pm 303.86

G₁ = Normal cows

G₂ = Cows with retained placenta

Animals were housed loose in semi-shaded open yards throughout the experimental period. According to their body weight and milk production level, the nutrition requirements were determined according to NRC (1988) allowances. Cows were fed concentrate mixture and rice straw, during the period from May to the end of November. During the rest of the year (from December to the end of April), cows were grazing on Egyptian clover (*Trifolium alexandrinum*) along with rice straw and concentrate mixture. Clean water for drinking was available all the day. Dams were allowed to nurse their calves seven days post-partum before being machine milked, twice daily at 08:00 and 16:00 h. Estrus was checked twice daily, at 07:00 and 17:00 h, by a vasectomized bull. The bull was left to run with the cows for a period of 30

minutes at each check round. Standing behaviour was considered as the main sign of heat and cows which showed that behaviour after 45 days post-partum was artificially inseminated. The reproductive tract and ovaries were palpated once weekly to determine the time of uterine involution and resumption of ovarian activity. Pregnancy was diagnosed applying rectal palpation 60 days after last insemination. Starting seven days after parturition till 80 days post-partum, blood samples were taken at three to four day interval from the jugular vein of each cow in heparinized tubes and centrifuged at 3000 rpm for 15 minutes then the collected plasma was stored at -20°C till progesterone assay. Direct radioimmunoassay (RIA) technique was performed using ready antibody coated tube kit (Spectoo 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% with corticosterone, 5 α dihydroprogesterone, and 11 deoxycorticosterone and less than 0.01% with any of the other steroids. The standard curve of progesterone ranged between 0.0 and 31.0 ng/ml. The sensitivity value of method is approximately 0.06-0.09 ng/ml. The intra and inter assay coefficients of variation were 7.9% and 8.1% respectively.

The first ovulation was determined by subtracting three days from the date at which a corpus luteum was first detected or day of estrus followed by palpable corpus luteum (Swiefy, 1997). The interval from parturition to complete uterine involution (PPUI), first ovulation (PPOI), first estrus (PPEI), first service (PPSI) as well as number of services per conception (NS/C), service period (SP), and days open (DO) were recorded.

The obtained data were statistically analyzed using Statistical Analysis System (SAS, 1990). Duncan's new multiple range test (Duncan, 1955) was used for the multiple comparison of the means.

RESULTS

Table (2) shows the interval from calving to uterine involution (PPUI), first ovulation (PPOI) and first estrus (PPEI) were significantly ($P < 0.05$) longer in cows with retained placenta (G_2) than in normal cows (G_1) by 6.9, 9.3 and 10.8 days, respectively. The corresponding change rate was -32.8%, -34.1% and 27.4%, respectively. The difference in post-partum service interval (PPS) was not significant (60.2 vs 78.8 days in G_1 and G_2 , respectively). Similar trend was observed concerning service period (SP) and days open (DO) which were significantly ($P < 0.05$) longer in cows with retained placenta (G_1) than normal ones (G_1) by 49.3 and 51.5 days, respectively. The corresponding change rate was 106.8% and -49.0%, respectively. The number of services per conception was nearly similar in the two experimental groups (2.8 and 3.0 services in G_1 and G_2 , respectively).

It should be noted, however, that only 4 out of 10 cows with retained placenta (40%, G_1) their uterus was returned to normal condition before 25 days post-partum compared with 90% of normal cows (G_1). During the first 30 days post-partum, only two out of 10 cows (20%) with retained placenta (G_2) reached to the first ovulation versus 70% of the normal ones (G_1) and the percentage of cows which showed their first estrus within the first 60 days post-partum was lower in cows with retained placenta than normal ones (40% vs 60%, respectively).

Table 2. Least square means (\pm S.E) of post-partum reproductive characteristics for the two experimental groups

Parameters	G ₁	G ₂	Change rate %
PPUP	21.0 \pm 1.2 ^a	27.9 \pm 2.2 ^b	- 32.8
PPOI	27.3 \pm 1.7 ^a	36.6 \pm 2.6 ^b	- 34.1
PPEI	39.4 \pm 2.1 ^a	50.2 \pm 4.3 ^b	- 27.4
PPSI	60.2 \pm 3.7 ^a	78.8 \pm 9.4 ^a	- 30.9
SP	46.2 \pm 8.2 ^a	95.5 \pm 15.3 ^b	- 106.8
DO	105.0 \pm 8.9 ^a	156.5 \pm 13.0 ^b	- 49.0
NS	2.8 \pm 0.4 ^a	3.0 \pm 0.4 ^a	- 7.1

(a, b) means within each row with different superscripts are significantly different (5%)

G₁ = Normal cows. G₂ = Cows with retained placenta.

Based on plasma progesterone concentration throughout the first 80 day post-partum (Table 3 and Figures 1 and 2), the average number of ovulation cases and ovulatory estrus cases per cow were insignificantly higher in normal cows (G₁) than in those with retained placenta (G₂) by -6.9% and -11.8%, respectively. While the incidence of quiet ovulation cases per cow was similar in the two experimental groups (1.2 cases/cow). However, normal cows (G₁) had insignificantly higher number of false estrus than in those with retained placenta (0.3 vs 0.1 cases/cow, respectively). It is worth noting that cows with retained placenta (G₂) had less number of complete ovarian cycles during the first 80 days post-partum period than normal cows (G₁) (1.6 vs 2.1 cycle/cow, respectively).

Table (3) and Figures (1 and 2) show that 4 out of 10 cows (40%) with retained placenta (G₂) showed irregular ovarian cycles *versus* 20% in normal cows (G₁). The important note is that two out of 10 cows (20%) with retained placenta (G₂) showed sustained anestrus period more than 70 days post-partum. The average of the first ovarian cycle length was nearly similar in the two experimental groups (23.8 \pm 2 and 22.7 \pm 2.2 days in G₁ and G₂, respectively, Table 3).

Data presented in Table (3) and Figures (1) and (2) show also, that the number of days to reach the first rise in plasma progesterone concentration \geq 1.0 ng/ml and to reach maximum plasma progesterone concentration value during the first ovarian cycle were nearly similar in the two experimental groups. However, the maximum value and average of plasma progesterone concentration during the first ovarian cycle were insignificantly higher in normal cows (G₁) than in those with retained placenta (G₂) by 9.6% and 16.0%, respectively.

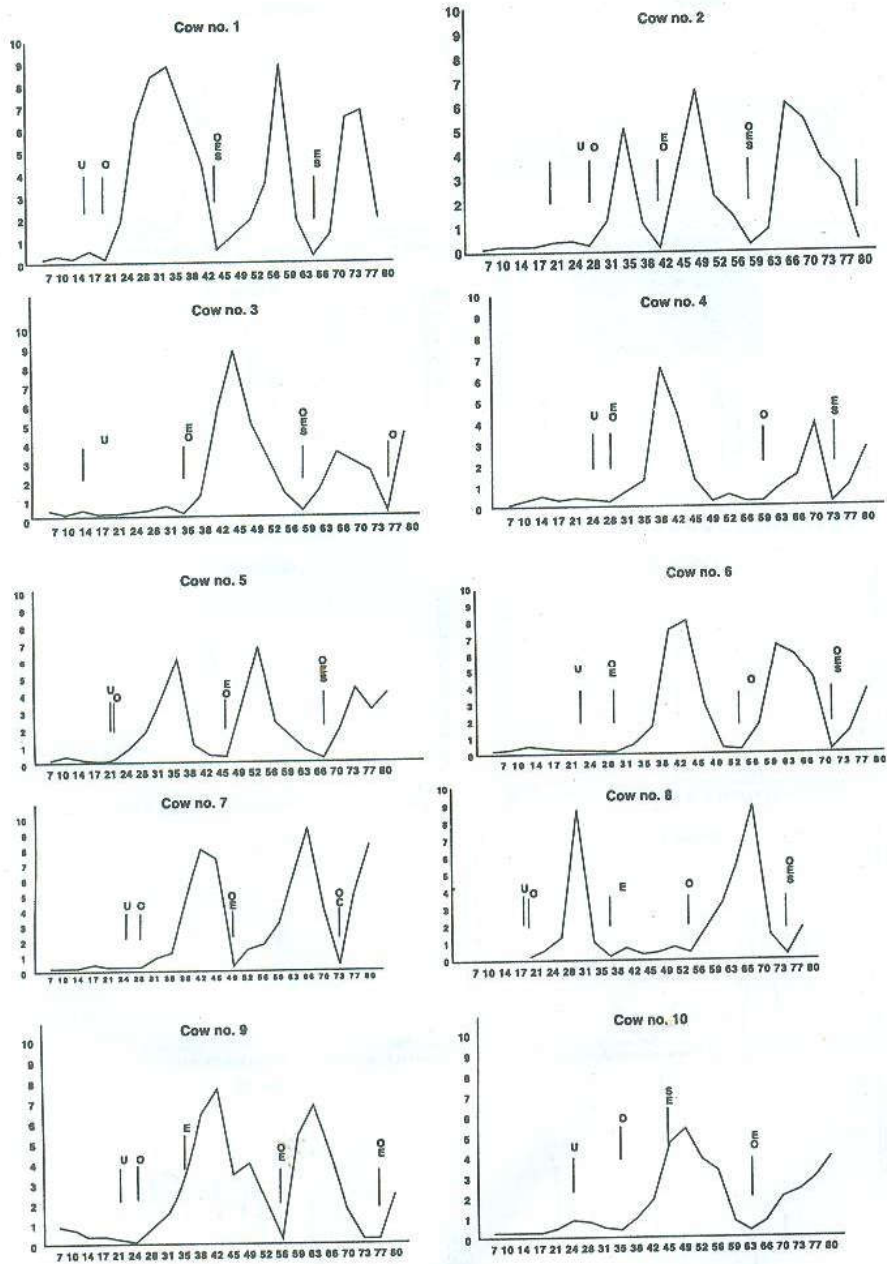


Figure 1. Progesterone profile throughout the first 80 days post-partum in normal cows
 U= Uterine involution O= Quiet ovulation E= Estrus S= Services

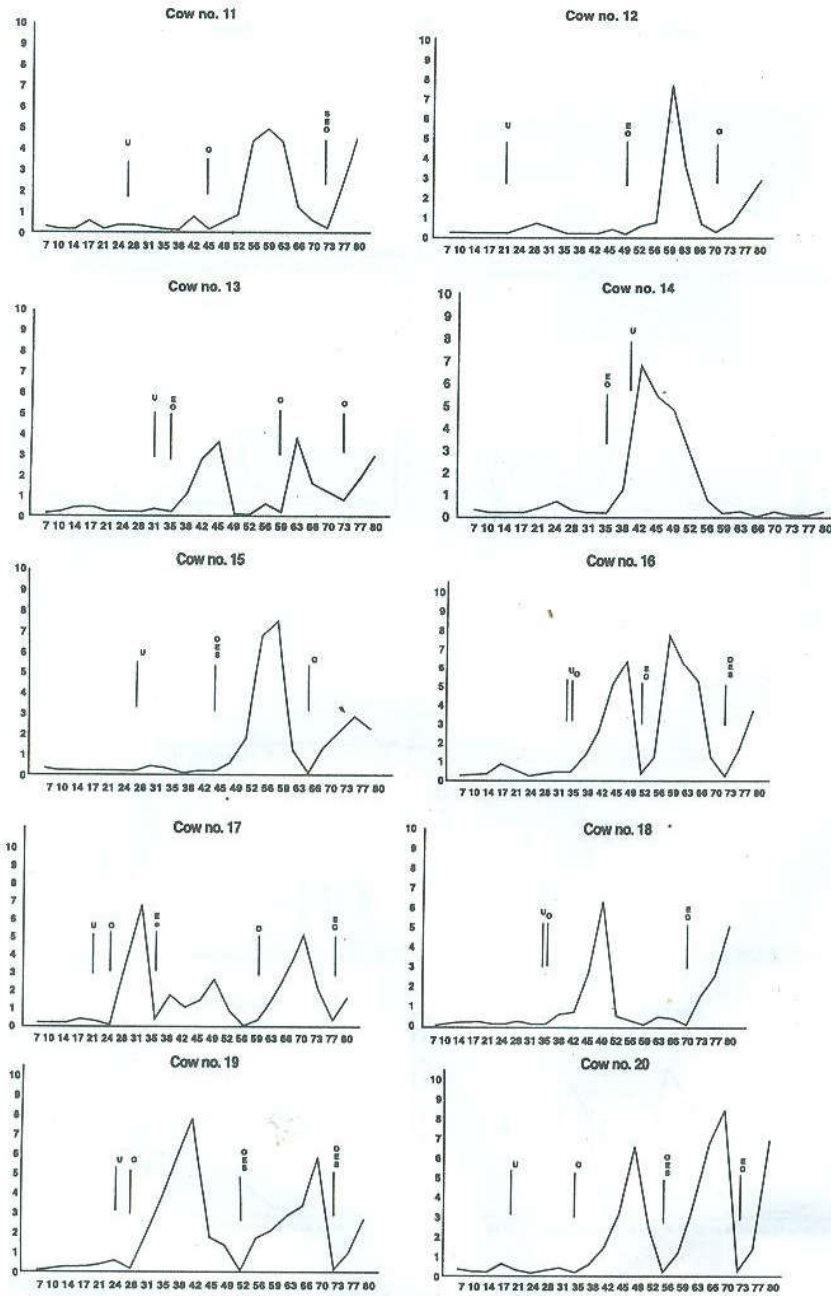


Figure 2. Progesterone profile throughout the first 80 days post-partum in retained placenta

U= Uterine involution O= Quiet ovulation E= Estrus S= Service

Table 3. Least square means (\pm S.E) of plasma progesterone (P_4) concentration and some ovarian activity parameters during the first 80 days post-partum in the two experimental groups

Parameters	G ₁	G ₂	Change rat%
Days of maximum P_4 level	12.4 \pm 0.9	12.3 \pm 0.8	-0.8
Value of maximum P_4 level (ng/ml)	7.3 \pm 0.4	6.6 \pm 0.4	-9.6
Day to reach \geq 1.0 ng/ml	4.4 \pm 0.6	4.7 \pm 0.9	+6.8
The first ovarian cycle length (day)	23.8 \pm 2.0	22.7 \pm 2.2	-4.6
Nmber of ovarian cycles/cow	2.1 \pm 0.2	1.6 \pm 0.2	-23.8
No. of irregular ovarian cycles	2.0	4.0	+50
No. of sustained anestrus more than 70 days	0.0	2.0	+100
No. of ovulation cases/cow	2.9 \pm 0.2	2.7 \pm 0.3	-6.9
No. of ovulatory estrus cases/cow	1.7 \pm 0.1	1.5 \pm 0.1	-11.8
No. of quiet ovulation cases/cow	1.2 \pm 0.1	1.2 \pm 0.1	0
No. of false estrus cases/cow	0.3 \pm 0.1	0.1 \pm 0.1	-66.7

The different between groups in all traits was not significant.

G1= Normal cows G2= Cows with retained placenta.

DISCUSSION

Retained placenta is a reproductive disorder which occurs at the end of one reproductive cycle and has repercussion on the next. The present study shows that fertility after retained placenta is impaired, this results agree with Halpen, *et al.*, (1985), Joosten *et al.* (1988); Osman (1991); Laven and Peters (1996), Emanuelson and Oltenacu (1998) and Fourichon *et al.* (2000). However, there are some contradictory reports such as Kay (1978).

In the present study lower reproductive performance of the cows with retained placenta might be attributed to that: a) 80% of cows with retained placenta resumed their ovarian function after the first 30 days post-partum, while, such cases was observed in only 30% for normal cows. This finding agrees in its trends with Schindler *et al.*, (1991); Simerl *et al.*, (1992) and Mellado and Reyes, (1994) who reporting that retard placenta is associated with increase in days to first ovulation; b) During the first ovarian cycle, cows with retained placenta had low maximum value and average of progesterone concentration by 9.6% and 16.0%, respectively, This was highly agreement with Royal *et al.* (2000) and c) Furthermore, during the first 80 days post-partum, cows with retained placenta had low complete ovarian cycles (1.6 vs. 2.1 cycles/cows), high irregular ovarian cycles (40% vs. 20%), more sustained anestrus period (20%) and ovulation cases/cow and ovulatory estrus cases/cow (6.9% and 11.8%, respectively). The reduction of the ovarian activity in cows with retained placenta may be due to the influence of stressful situation impairing correct endocrine initiation of ovarian cyclicity.

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cows with retained placenta may be due to the influence of stressful situation impairing correct endocrine initiation of ovarian cyclicity.

Moreover, the obtained results indicated that cows with retained placenta have been associated with slower uterine involution as has also been reported by Morrow *et al.* (1966), Hafez (1993), Peters and Ball (1995) and Bearden and Fuquay (1997). The long period from parturition to uterine involution with retained placenta may explain the cause of delayed exhibited signs of heat after parturition (Tindall, 1984), delayed ovarian cyclicity (Madej *et al.*, 1983) and delayed conception (Young, 1989). Furthermore, the incidence of metritis was greater for cows with retained placenta than normal cows as reported by Joosten *et al.* (1988), Hafez (1993), Peters and Ball (1995) and Fourichon *et al.* (2000). The incidence of metritis is thought to be the major reason by which the condition affects fertility (Laven and Peters, 1996 and Emanuelson and Oltenacu, 1998).

Finally, the present results indicated that retained placenta in Friesian cows have been associated with poor reproductive performance and decrease in ovarian activity.

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تأثير حدوث احتباس المشيمة على الأداء التناسلي بعد الولادة في أبقار الفريزيان.

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أجريت هذه الدراسة بمحطة بحوث الإنتاج الحيواني بسخا محافظة كفر الشيخ التابعة لمعهد بحوث الإنتاج الحيواني على ٢٠ بقرة فريزيان خلال الفترة من مارس حتى أكتوبر لدراسة تأثير حدوث احتباس المشيمة على الأداء التناسلي بعد الولادة. قُسمت الأبقار لمجموعتين متساويتين تبعاً لحدوث إحتباس المشيمة (كل مجموعة ١٠ أبقار) وكانت المجموعة الأولى تضم الأبقار التي لم يحدث لها إحتباس مشيمة بينما ضمت المجموعة الثانية الأبقار التي حدث بها احتباس مشيمة. و قُدرت الفترة من الولادة حتى عودة الرحم لحجمه الطبيعي و أول تبويض وأول شياح و أول تلقيح و فترة التلقيح كذلك ثم تقدير عدد التلقيحات اللازمة للإخصاب و فترة الأيام المفتوحة. أظهرت النتائج إن الأبقار التي لم يحدث لها إحتباس مشيمة (المجموعة الأولى) بالمقارنة بالأبقار التي حدث لها احتباس مشيمة (المجموعة الثانية) كانت أكثر معنوياً في كلا من الفترة من الولادة حتى عودة الرحم لحجمه الطبيعي و أول تبويض و أول شياح و فترة التلقيح و فترة الأيام المفتوحة. بينما كانت عدد التلقيحات اللازمة للإخصاب و معدل حدوث التبويض الصامت خلال الثمانين يوم الأولى بعد الولادة كانت متشابهة في كلا المجموعتين.