Vet. Med. J., Giza. 38, No. 3, 459-466 (1990)

MILK PROGESTERONE IN COWS DURING OESTROUS CYCLE AND POSTPARTUM PERIOD AS A MONITOR OF REPRODUCTIVE STATUS.

BY

A.A. SEIDA, EL-S.M. FATTOUH AND A.M. GHALLAB.

Cairo University, Faculty of Veterinary Medicine
Department of Theriogenology, Giza, Egypt.
Giza, Egypt.

(Received: 28.7.1990).

INTRODUCTION

Progesterone is today a well-known biochemical and physiological entity and its role in oestrous cycle and maintaining pregnancy is well accepted. The day to day variation in milk progesterone in nonpregnant cows display acyclic pattern (oestrous cycle). Knowledge of the levels of progesterone in milk during different reproductive phases of the cow could be of tremendous benefit to the clinician for gynaecological examiantion. Previous studies on the same point were conducted by Laing and Heap, (1971); Heap, Gwyn, Laing and Walters, (1973); Pennington, Spahr and Lodge, (1981); Van de Wiel, Kamonpatana, Ngramsurijaroy, Koops and Singhajan, (1982); Foulkes , Godkson and Sauer 1982; Nakao, Sugihashi, Kawata, Saga and Tsunoda, 1983; Youngquist, Bierechwal and Clark, 1985 and Stanley, Paris, Webb, Heap, Ellis, Hamon, Worsfold and Booth, 1986.

Development of assays for quantifying progesterone in milk has enabled close monitoring of postpartum luteal function, by (Lamming and Bulman 1976 ; Bulman and Lamming, 1978; Bulman and Wood, 1980; Pahwa and Pandey, 1983, Kassa, Ahlin and Larsson, 1986 and Stanely, et al., 1986).

The present study was carried out to determine the changes in progesterone levels in cows milk during the normal oestrous cycle and postpartum period using the AELIA system.

MATERIALS AND METHODS

Twelre the dairy cows from Texas A & M dairy herd were used for this study. The animals had regular oestrous cycles and were maintained under the normal condition of commercially managed herds. They were checked daily for behavioural oestrus. Milk samples were collected on alternate days, starting from day of oestrus (day 0) to monitor the pattern of progesterone throughout the oestrous cycle.

Three cows were sampled daily after calving for 35 days postpartum, to determine the time of onset of ovarian activity in the postpartum period.

All milk sampels were collected in the early morning from a whole milk and were preserved by adding potassium dichromate tablet (0.1% W/V) in every sample.

Milk progesterone was assayed by the AELIA system using (Enzygnost milk progesterone, (Hoechst kits).

The data were statistically analysed according to Snedecor and Cochran (1970).

RESULTS AND DISCUSSION

I. Oestrous cycle

Measurments of milk progesterone concentration of 12 cows by AELIA method revealed that 1, 3, 7 and 1 cows had oestrous cycle 19, 20, 21 and 22 days

respectively. The mean oestrous cycle length was found 20.66 ± 0.22 days **(Fig. 1)**, This cycle length agreed with the results reported by Heap and Holdworth, 1981; Pennington, et al., 1981, Van. de. Wiel, et al., 1982; Foulkes, Cookson and Sauer, 1982; Nakao, Sugihashi, and Kawato, 1983 a; and Nakao , Sugihashi, Saga, Tsunoda and Kawato, 1983 b,. Longer oestrous cycle of 22.5 ± 0.46 days was reported by Stanley et al. (1986).

The progesterone levels remained below 5 ng/ml on days 0-4 and days 18-21 of oestrous cycle with a mean of 7.33 ± 0.18 days (Follicular phase); while the level of progesterone was higher than 5 ng/ml on days 5 to 17 with a mean of 13.33 ± 0.26 days of the cycle (Luteal phase) as shown in **(Fig. 1)**, These findings agreed with those reported by Heap and Holdsworth, (1981); Pennington, et al., (1981); Van de Wiel et al. (1982) Nakao, et al. (1983 a and b), and Stanley et al. (1986).

The sharp decrease in milk progesterone on the third week of oestrous cycle give indicates that the next cycle will start within 3-4 days. This will help in prediction of oestrus specially in herd with infertility problems such as silent heat and unobserved heat. This result confirms those reported by many worker for prediction of oestrus (Abbitt, 1990 ; Glancross and Abeywardene, 1983; Nakao, et al.,1983 b, Mia, Pancari and Babu, 1986 and Stanley et al.(1986).

Both the day of sampling and phase of the cycle had significant effects on milk progesterone concentration ($P < 0.01$ and < 0.05, respectively) which agree with the resultes of Pennington et al. (1981).

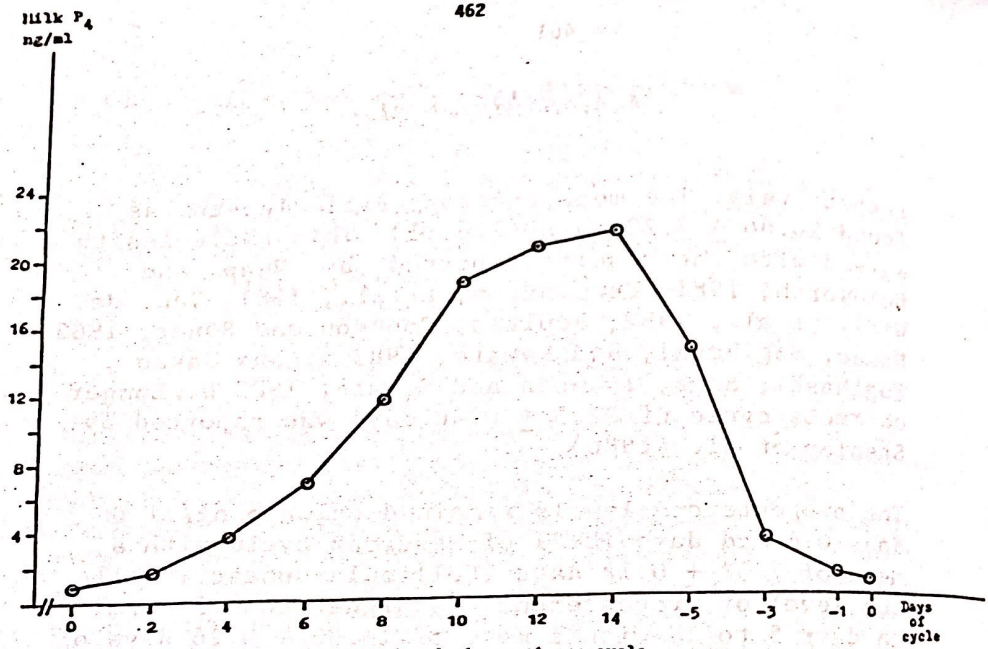

Fig.1: Milk progesterone concentration during oestrous cycle

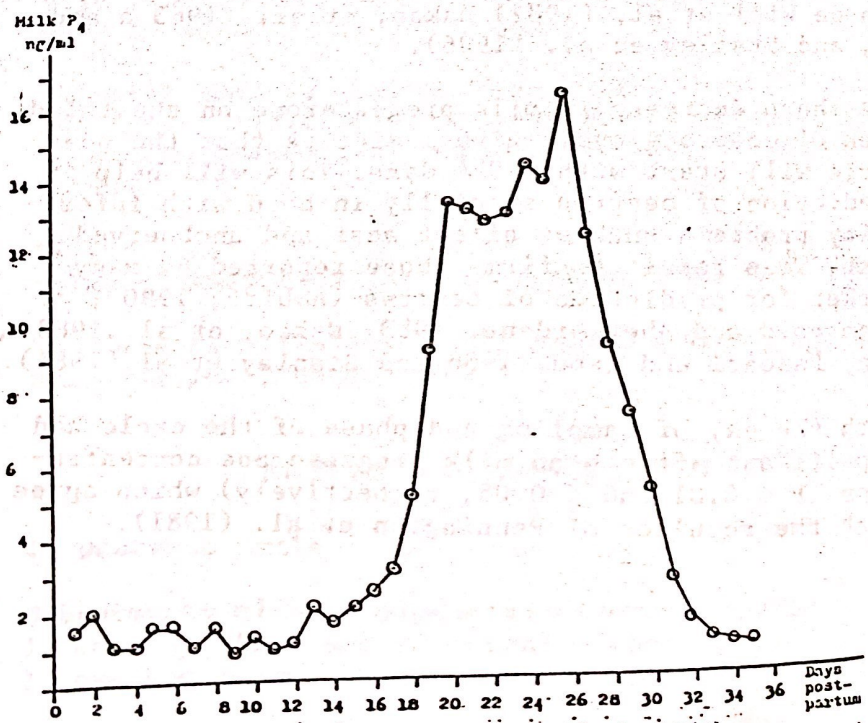

Fig.2: Milk progesterone concentration during post partum period

II. Postpartum milk progesterone concentration.

The changes in concentration of milk progesterone were measured by enzymeimmunoassay during 35 days post partum. The mean daily concentration of progesterone are shown in (Fig. 2). During the first 15 days postpartum, where it did not exceed 2 ng/ml , A result which is close to those reported by Schiavo, et al. (1974). Pahwa and pandey (1983). Kassa, et al. (1986) and Stanley et al. (1986).

The gradual increase in progesterone concentration after the day 15 postpartum with a maximum concentration at day 26 postpartum (Fig. 2) indicates ovulation and start of ovarian activity. Similar results were reported clinically by Marion and Gier (1968) and Morrow et al. (1969). They indicated that the first ovulation in dairy cows occured on approximately 15 days postpartum with high incidence of silent estrus (77% to 86%).

SUMMARY

The mean oestrus cycle length measured by milk progesterone assay was found to be 20.66 $\pm$ 0.22 days and the follicular phase was about 7.33 $\pm$ 0.18 days; while the luteal phase was about 13.33 $\pm$ 0.26 days. The progesterone concentration in the milk was significantly affected by day and phase of the cycle.

The milk progesterone concentration did not exceed 2 ng/ml during the first 15 days postpartum, but its level increase gradually to reach a peak as (17 ng/ml) on day 26 postpartum.

REFERENCES

1. Abbitt, B. (1980): Milk progesterone assays in pregnancy diagnosis. Proced. of the 12th Ann. convention Am. Ass. of bovine practitioners. San Antonio Texas: 123-125.

2. Bulman, D.C. and Lamming,G.E. (1978): Milk progesterone levles in relation to conception, repeat breeding and factors influencing acyclicity in dairy cows. J. Reprod. and Fertil 54: 447-458.

3. Bulman, D.C. and Wood,P.D.P. (1980): Abnormal patterns of ovarian activity in dairy cows and their relationships with reproductive performance. Anim. Prod. **34**, 264-275.

4. Foulkes, J.A., Godkson, A.D. and Sauer, M.J. (1982): Artifical insemin of cattle based on daily enzyme immunoassay of progesterone in whole milk. Vet. Rec. **111**, 302-303.

5. Glancross, R.G. and Abeywardene, S.A. (1983): Concentration of oestredioal 17 B and progesterone in plasma and defatted milk of cattle during the oestrous cycle. Br. Vet. J. **139**, 49-51.

6. Heap, R.B. and Holdsworth, R.J. (1981): Hormones assays in reproduction and fertility. Br. Vet.J. **137**, 561-571.

7. Heap, R.B., Gwyn, M. Laing, J.A. and Walters, D.E. (1973): Pregnancy diagnosis in the cow: changes in milk progesterone concentration during the oestrous cycle and pregnancy measured by rapid radioimmunoassay. J. Agric. Sci **81**, 151-157.

8. Kassa, T., Ahlin, K.A. and Larsson,K. (1986) : Profile of progesterone in milk and clinical ovarian findings in postpartum cows with ovarian dysfunction Nord. Vet. Med. **38**, 360-369.

9. Laing, J.A. and Heap,R.B. (1971): The concentration of progesterone in the milk of cows during the reproductive cycle. Br. Vet. J. **127**, 19-23.

10. Lamming, G.E. and Bulman, D.C. (1976): The use of milk progesterone radioimmunoassay in the diagnosis and treatment of sub-fertility in dairy cows Br. Vet. J. **132**, 507-517.

11. Marion, G.B. and Gier, H.T. (1968): Factors affecting bovine ovarian activity after parturition. J. Animal Sci: **27**, 1621-1625.

12. Mia, A.S., Pancari G.D. and Babu U.M. (1986): ELISA determination of milk progesterone concentration in cattle. j. Dairy Sci 69: Suppl - 244 Abst. D 16.

13. Morrow, D.A., Roberts S.J. and McEntee,K. (1969): Postpartum ovarian activity and involution of the uterus and cervix in dairy cattle I. Ovarian activity. Cornell Vet. **59**, 173-190.

14. Nakao, T. Sugihashi, A., Saga, N. Tsunoda, N. and Kawato, K. (1983 a): An improved enzymeimmunoassay of progesterone applied to bovine milk. Br. Vet. J. **139**, 109-118.

15. Nakao, T., Sugihashi, A., Kawato, K. Saga, N. and Tsunoda, N. (1983 b): Milk progesterone levels in cows with normal or prolonged estrous cycles Referenced to an early pregnancy diagnosis JPn. J. Vet. Sci. **45** (4): 495-499.

16. Pahwa, G.S. and Pandey, R.S. (1983): Hormonal changes in postpartum blood plasma and milk of buffaloes (Bubalus Bubalus). Anim. Prod. **37** : 237-246.

17. Pennington, J.A. Spahr, S.L. and Lodge, J.R. (1981): Influences on progesterone concentration in bovinc milk. J. Dairy. Sci. 64, 259-266.

18. Schiavo J.J., Matuszcak, R.L. Oltenacu, E.B. and Foote, R.H. (1975): Milk progesterone in post-partum and pregnant, cows as a monitor of reproductive status J. Dairy Sci 58: 1713-1716.

19. Snedecor, G.W. and Cochran, W.G. (1970): Statistical methods, 6th Ed., Ames. Iowa USA.

20. Stanley, C.J., Paris, F., Webb, A.E., Heap, R.E., Ellis, S.T., Hamon, M. Worsfold, A. and Booth, J. M. (1986): Use of new and rapid milk progesterone assay to monitor reproductive activity in the cow. Vet. Rec. 118, 664-667.

21. Van de Wiel, D.F.M., Kamompatana, M. Ngramsurijaroy, Ch. Koops, W. and Singhajan, S. (1982): Enzyme immunoassay of milk progesterone its application to oestrus confirmation and early pregnancy diagnosis in cattle. Vet. Q. 4, 72-78.

22. Youngquist, R.S., Bierechwal, C.J. and Clark, B. L. (1985): Clinical application of enzymeimmunoassay for progesterone. Proc. of the Ann. Meet. Soc. for Theriogenology. Sacramento Califoriona 80-89.