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Research article

RELATIONSHIP BETWEEN PROGESTERONE CONCENTRATIONS IN MILK AND SERUM DURING POSTPARTUM PERIOD IN MONTBELIARD DAIRY COWS IN ALGERIAN HIGH PLAIN REGION.

Nabila Kara*, Mustapha Bounechada and Belkacem-chawki Chaib

*****Departement of Agronomy, Faculty of Nature and Life Sciences; Laboratory of Development and Production of Vegetal and Animal Setif University, Algeria.
*****Correspondence should be addressed to Nabila Kara; Email: nabila_kara2000@yahoo.com
Telephone: 00213 77 82 38 71

ABSTRACT: The objective of this study was to investigate relationship between progesterone concentrations in milk and serum during postpartum period in Montbeliard dairy cows in Algerian high plain region. The relationships between the concentration of milk and serum progesterone on different days of postpartum was a significant *(P < 0.05)* linear, logarithmic, quadratic, cubic and expentiel relationship between the concentration of milk and serum progesterone on each of 30, 40 and 50 days postpartum.

Keywords: Montbeliard, postpartum, quadratic, chimiluminescent progesterone, semi arid area.

INTRODUCTION

Reproductive efficiency of dairy herds is low [1, 2]. Many causes have been identified but postpartum ovarian activity, or failure to detect postpartum ovarian activity, is a major factor in all studies. Assays of steroid hormone in blood plasma and milk had provided much information about the postpartum ovarian activity in the bovine. Progesterone, a key hormone in regulating the estrous cycle, has been measured in milk [1,3], which offers considerable advantage over blood plasma for field studies because of its ease of collection. Close correlations between concentrations of progesterone in serum and milk have been shown [4]. The objective of this study was to investigate relationship between progesterone concentrations in milk and serum during postpartum period in Montbeliard dairy cows in Algerian high plain region.

MATERIALS AND METHODS

Data were collected from 130 Montbeliard cows in the four departments of Algerian eastern high plains during September 2011 à December 2012. The cows were housed in a free stall the cows were fed an *ad libitum* mixture of grass silage and mineral supplements. Blood and milk samples (10 ml) were collected from each cow on days 30, 40 and 50 after calving. The blood samples were collected from the jugular vein into a vacutainers (Becton Dickinson Vacutainer® Systems, Grenoble, France). Serum samples (130) was separated by centrifugation at 3000 rpm for 15 min and stored at - 4C° until hormonal assay. Morning whole milk sample was collected from all cows up by mammary glands. The milk was refrigerated immediately after collection and usually within a day was frozen until the time of hormonal assay. Progesterone (P4) concentration was assessed through chimiluminescent immuno- assay using the kit (Immunotech kit, Class-specific antibodies to bovine; UK) and clinical chemistry automated analyzer (Immulite 1000) in Setif hospital, laboratory, Algeria. The detection limit for P4 was 0.1 ng/ml and the intra- and inter-assay coefficients of variation were 5% and 7% respectively. The intra-assay coefficient of variation progesterone concentration in milk was less than 14%. The limit of sensitivity, using a 50 µl sample, was less than 0.2 ng/ml.
The data were presented as means ± standard error (SE). Correlations between milk and plasma progesterone concentration were examined using Pearson correlation.

The second test is a multiple regression analysis to adjust a possible repartition between cows and concentrations of serum and milk progesterone on same postpartum days was. A probability value of $P < 0.05$ was considered significant. All analyzes were established using SPSS procedure [5].
Resumption ovarian activity was monitored by measuring daily progesterone concentrations in samples collected during 30, 40 and 50 days postpartum. Progesterone concentration was used to determine the occurrence of resumption of ovarian activity. An increase of progesterone concentration above the average progesterone baseline of individual cows in three consecutive samples that exceeded 1ng/ml in serum or ≥3 ng/ml in whole milk, was used to determine the occurrence of resumption of ovarian activity in diary cows [6].

RESULTS AND DISCUSSION

Correlation between whole milk and serum progesterone during 30, 40 and 50 days postpartum

Data of correlation between whole milk and serum progesterone during 30, 40 and 50 days postpartum was summarized in Table 2. Analysis of the results shows that concentrations of progesterone in whole milk and serum samples were correlated ($P<.0.0001$; table 2). Close correlations between milk and plasma progesterone concentrations are found in most studies ($r = 0.88$, $r= 0.95$) [7, 8] justifying the use of milk progesterone values to monitor endocrine changes in postpartum period [7]. While the pattern of progesterone content in milk parallels that of plasma, values for milk are higher than values summarized by [9] for blood plasma. This agrees with the findings of [10] who found that progesterone content of milk was higher than that of plasma in no pregnant animals. There is evidence that the mammary gland is able to extract progesterone from arterial blood and possibly to synthesize it [11]. Harkness and Darling [12] suggested that steroids in milk may depend on steroid metabolism by the mammary gland.

Table 1. Statistical parameters of the individual variation in whole milk and serum progesterone during 30, 40 and 50 days postpartum

Hormone (ng/ml)	*n*	*Min-Max*	*Means*	*± SD (ET)*	*± ES*
P4 30 serum	130	0.010- 1.380	0.308	0.338	0.029
P4 40 serum	130	0.014-1.440	0.545	0.449	0.039
P4 50 serum	130	0.0180-1.66	0.824	0.512	0.044
P4 whole milk 30	130	0.11-6.00	2.00	1.249	0.109
P4 whole milk 40	130	0.15-7.32	2.423	1.514	0.133
P4 whole milk 50	130	0.20-6.34	2.910	1.50	0.133

P4: progesterone; 30, 40, 50, day postpartum

Table 2. Correlation between concentration of progesterone in serum and whole milk in 30, 40 and 50 day postpartum

Hormone (ng/ml)	P4 30 Serum	P4 40 Serum	P4 50 Serum	P4 30 whole milk	P4 40 whole milk	P4 50 whole milk
P4 30 serum		0.821**	0.697**	0.676**	0.639**	0.517**
P4 40 serum			0.875**	0.658**	0.653**	0.627**
P4 50 serum				0.567**	0.582**	0.641**
P4 30 whole milk					0.896**	0.774**
P4 40 whole milk						0.847**
P4 50 whole milk						

***Significance correlation, P< 0.0001*

Correlation between whole milk and serum progesterone and probability of repartition of cows resuming postpartum activity during 30, 40 and 50 days postpartum.

A multiple regression analysis between whole milk and serum progesterone and probability of repartition of cows resuming postpartum activity during 30, 40 and 50 days postpartum was summarized in figure 1.

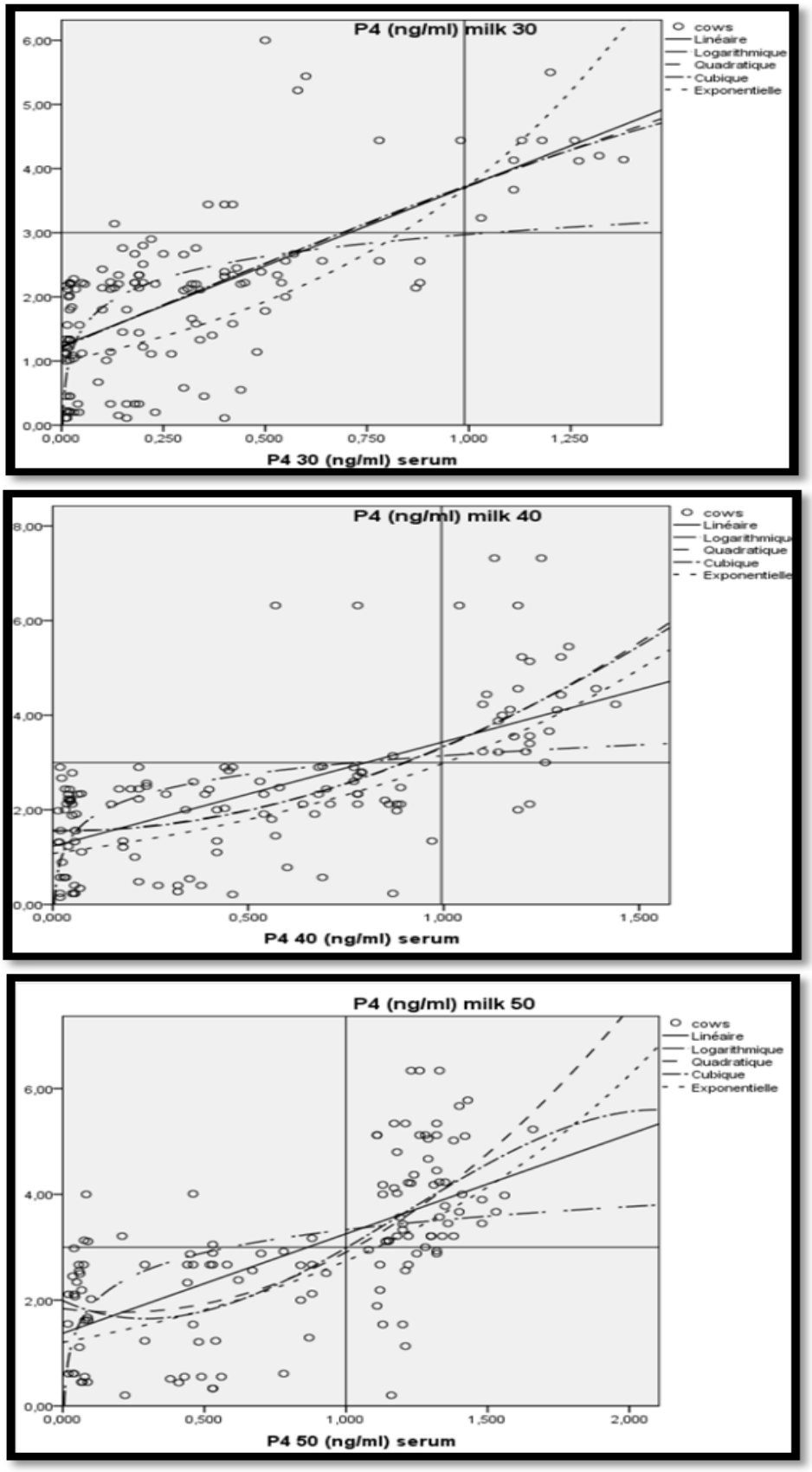

Figure-1: Correlation between whole milk and serum progesterone and probability of repartition of cows during 30, 40 and 50 days postpartum

The luteal activity is indicated by the first of at least consecutive progesterone concentrations ≥3 ng/ml in whole milk. Cow with serum progesterone concentrations ≥1.0 ng/ml were considered to have luteal activity. Ovulation was considered to have taken place 5 days before the first increase in progesterone concentration ≥ 1 ng/ml [6].
To our knowledge this is the first report demonstrating a positive correlation between whole milk and serum progesterone and probability of repartition of cows during 30, 40 and 50 days postpartum. The current study indicates an increased probability of cows resuming postpartum activity with increasing concentrations of progesterone in whole milk and serum at 30, 40 and 50 days postpartum.

CONCLUSIONS

This study confirms a positive linear, logarithmic, quadratic, cubic and expentiel association between milk and serum progesterone concentrations on Days 30, 40 and 50 postpartum. The determination of progesterone concentrations in milk is a potentially useful tool both in the investigation of the cause(s) of early postpartum period.

REFERENCES

[1] Ginther O J, Nuti L, Wentworth B C and Tyle W J. 1974. Progesterone concentration in milk and blood during pregnancy in cows. Proc. Soc. Exp. Biol. Med. 146:354.

[2] Spalding R. W, Everett R.W and Foote R H. 1975. Fertility in New York artificially in semi -nated Holstein herds in Dairy Herd Improvement .J. Dairy. Sci.58:718.

[3] Heap R. B, M. Gwyn J A. Laing and Waiters D E.1973. Pregnancy diagnoses in cows; changes in milk progesterone concentrations during the estrous cycle and pregnancy measured by a rapid radioimmunoassay. J. Agric. Sci. 81:151

[4] McNeilla R E, Diskin MG, Sreenan JM, Morrisa D G.2006. Associations between milk progesterone concentrations on different days and with embryo survival during the early luteal phase in dairy cows. Theriogenology 65, 1435–1441.

[5] SPSS, Inc., 2010. SPSS 18.0. Chicago : M. J. Norusis.

[6] Mojtaba, K., Abdolah, M., Amin T., & Mehdi, S. (2012). Factors affecting the occurrence of postpartum prolonged luteal activity in clinically healthy high-producing dairy cows. The riogenology, 77: 421-429.

[7] Dobson H and Fitzpatrick RJ, 1976. Clinical application of the progesterone in milk test. Vet. J. 132, 538–54

[8] Hall J G, Branton C, Stone E J. 1959. Estrus, estrous cycles, ovulation time, time of service, and fertility of dairy cattle in Louisiana. J. Dairy Sci. 77, 1086–1094.

[9] Roelofs J B, Van Eerdenburg B W. Hazelegera N M and Soede B.Kemp.2006. Relationship between progesterone concentrations in milk and blood and time of ovulation in dairy cattle. Animal Reproduction Science 91, 337–343.

[10] Hansel W, Concannon P W and. Lukaszew- ska J H. 1973. Corpora lutea of the large domestic ani- mals. Biol. Reprod. 8:222.

[11] Heap R B, Gwyn M J A, Laing and Waiters D. E. 1973. Pregnancy diagnoses in cows; changes in milk progesterone concentrations dur- ing the estrous cycle and pregnancy measured by a rapid radioimmunoassay. J.Agric.Sci. 81:151.

[12] Harkness R A and Darling J A. B. 1971. Steroid levels in milk. Acta Endocrinol. Supp 155:92.