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RELATIONSHIP BETWEEN FERTILITY AND SOME BLOOD METABOLITES IN BUFFALOES

(With 2 Tables)

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العلاقه بين مستوى الخصوبه وكذا بعض مركبات الدم فى الجاموس

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تم إجراء هذه الدراسه على عدد ١٥ جاموسه عشار فى الفتره الأخيره من الحمل فى مزرعة كلية الطب البيطرى-جامعة قناة السويس فى الفتره من مارس ١٩٩٦ وحتى فبراير ١٩٩٧. تم أخذ عينات دم من هذه الحيوانات إبتداءاً من فترة أسبوعين قبل الولاده وحتى الأسبوع الثامن بعد الولاده بواقع عينه أسبوعياً من كل حاله. وبعد فصل مصل الدم تم قياس تركيز بعض العناصر مثل الجلوكوز-اليوريا-الكوليسترول الكلى-البروتين الكلى-الزلال-الجلوبيولين-نسبة الزلال/ الجلوبيولين. كما تم أيضاً تقييم الحاله التناسليه فى هذه الحيوانات من خلال الجس عن طريق المستقيم وبالتحليل الاحصائى لهذه النتائج أوضحت الدراسه وجود ارتباط معنوى سالب بين مستوى كل من اليوريا-الزلال، ونسبة الزلال/الجلوبيولين فتره ما قبل الولاده بأسبوعين وطول الفتره اللازمه لحدوث حمل بعد الولاده وكذا تأخر بدء نشاط المبايض بعد الولاده. وكذلك فى الحالات التى تم الحمل فيها بعد فترة تتراوح من ٧٥ر١٥٨±١٦ر٢٠ يوماً من الولاده كان هناك إنخفاضاً معنوياً فى مستوى كل من اليوريا-الزلال فترة ما قبل الولاده بأسبوعين مقارنة بإنخفاض معنوى فى مستوى الكوليسترول الكلى والزلال فترة ما بعد الولاده. وأيضاً بالنسبه للحالات التى عانت من توقف نشاط المبايض لفترة ٢١٠ يوماً بعد الولاده كان هناك إنخفاضاً معنوياً فى مستوى عناصر الجلوكوز-اليوريا-الكوليسترول الكلى-الزلال-الجلوبيولين وكذا نسبة الزلال/الجلوبيولين قبل وبعد الولاده مقارنة بحالات مستوى الخصوبه فيها طبيعياً.

SUMMARY

The relationships between periparturient serum levels of glucose urea, cholesterol, total protein, albumin, globulin, A/G ratio and subsequent fertility were studied in 15 pregnant buffalo-cows. Weekly blood samples were taken two weeks antepartum till eight weeks postpartum. A high significant ($P<0.01$) negative correlation between antepartum serum levels of urea, albumin, A/G ratio and postpartum fertility was found. After calving, a similar relationship was noticed between glucose, albumin and fertility. In buffalo - cows with significantly longer calving - conception interval (158.75 ± 20.16 days), a high significant ($P<0.01$) decrease in urea and albumin concentrations before calving comparaed to a marked decrease of gluose, cholesterol and albumin levels after calving was found. Delayed onset of cyclicity till 210 days postpartum was associated with persistently lower levels of glucose, cholesterol, urea, albumin, globulin and A/G ratio around calving.

Key words: *Buffaloes – Fertility – Blood metabolites.*

INTRODUCTION

Although it is generally accepted that nutrition has a major effect on dairy cow fertility, the figure regarding blood composition and fertility is conflicting (McClure 1968; Morrow et al., 1969; Lotthammer and Farries 1977; Butler et al., 1981 and Howard et al., 1987).

According to Miettinen (1990), no biochemical measurements can be used as a reliable mean for diognosing situations likely to lead to reduced herd fertility before the effects are manifest.

Therefore, this study aimed to throw some light on the relationship between levels of some blood parameters as urea, glucose, cholesteral, total protein, albumin, globulin, albumin / globulin ratio (A/G ratio) during the periparturient period and subsequent fertility.

MATERIALS and METHODS

Animals:

A total of 15 pregnant buffalo-cows, age 4-8 years at the animals farm, Fac. Vet. Med., at Ismailia were used in this study. Feeding of these animals comprised concentrates and green fodders twice a day in the morning and in the afternoon. Rice straw was always supplied. Weekly blood samples were collected two weeks before calving till eight weeks postpartum. After centrifugation, the obtained serum was kept at -20°C till being analysed.

The fertility of each animal was assessed by rectal palpation starting at day 90 postpartum and repeated monthly when necessary to diagnose pregnancy. Cases that showed no cyclic activity by this time, rectal exmination was carried out weekly till day 210 postpartum. Animals that concieved, the calving-conception interval was calculated. Such work started from March 1996 till the end of February 1997.

Biochemical analysis: Serum glucose, cholesterol, urea, total protein and albumin were colorometrically determined with test kits according to Trinder (1969); Allain (1974); Patton and Crouch (1977); Doumas et al., (1981) and Webster (1977) respectively. By subtracting the obtained albumin level from total protein serum globulin was given. Albumin / globulin ratio (A/G ratio) was also calculated.

Statistical analysis: of the obtained data comprised regression analysis and student, t-test (Steel and Torrie, 1980)

RESULTS

The data concerning serum biochemical analysis in relation to postpartum reproductive performance were presented in Table (1).

A high significant ($P< 0.01$) decrease in the serum levels of urea, albumin and A/G ratio was noticed two weeks anteparum among buffalo-cows with calving concepton interval 158.75 ± 20.16 days.

Two buffalo-cows that failed to show cyclic activity till 210 days postpartm persistently lower levels of glucose, urea, albumin and A/G tratio were demonstrated.

As shown in Table (2), the negative correlation between antepartum serum levels of urea, albumin, A/G ratio and fertility was highly significant ($P<0.01$). There existed also a significant ($P< 0.05$)

positive correlation between serum level of globulin before calving and subsequent fertility.

Similarly, a high significant ($P<0.01$) negative correlation between serum bevel of glucose after calving and fertility compared to a significant ($P<0.05$) negative correlation with that of albumin.

DISCUSSION

Buffalo-cows that concieved within 104.2 ± 9.5days postpartum, serum levels of cholesterol, urea, total protein, albumin, golbulin and A/G ratio showed no significant differences between pre and postpartum period.

Only glucose concentration increased significantly ($P<0.05$) after calving that may agreed those of Sommer (1970), Lotthammer et al. (1971) and Shehata (1987). By contrast, Rowlands et al. (1980), Kappel et al., (1984) and Eldon et al. (1988) reported that plasma glucose increased before calving and then decreased to a minimum value between 11 and 25 days postpartum. In this aspect, Butler et al., (1981), and Eldon et al. (1988) stated that the interval from parturiton to first normal ovulation was inversely related to average energy balance during the first 20 days postpartum.

On the other hand, the obtained data in this study came in agreement with those of Miettinen (1991) who indicated that if shorter calving intervals are desired, adequate energy balance (high levels of glucose and urea) in puerperium is essential.

With regared to (8) buffalo-cows that showed prolonged calving conception intervals (158.75 ± 20.16 days), the marked decrease in glucose, albumin and urea concentrations during 8 weeks postpartum were in line those of Ried et al., (1979) who recorded that significantly longer calving interval and significantly greater number of services to conception in cows with significantly lower levels of glucose and albumin. Moreover the obtained findings were in accordance with the findings claimed that a negtaive energy balance can result in reduced function of the corpus luteum, low progesterone concentration during luteal phase and reduced fertility (Hill et al., 1970; Knutson and Allrich, 1988; Villa - Godoy et al., 1988). The findings of this study that showed persistently lower levels of glucose cholesterol and urea among buffalo-cows that showed no cyclic activity up to 210 days postpartum were in

support to those obtained by Bostedt et al. (1976), Butler et al. (1981) and Huszenicza et al. (1988) who stated a harmful effect of the low energy balance as well as decreased cholesertol concentration on the ovarian activity. In that sense, ovarian subfunction may be due to the incapacity of ovarian tissue respond to LH in animals in state of negative energy balance (Gombe and Hansel, 1973). Moreover, an alternative hypothesis is that as nervous tissue has a primary requirment for glucose for its metabolism (Armstrong, 1965), hypoglycemia during early lactaton may therefore results in subfunction of the hypotyhalums / hypophysis and reduced rate of production of GnRH and/or FSH/LH (Butler and Smith, 1989). On the contrary athough the role of cholesterol in the progesterone synthesis has been reviewed earlier (Swann and Bruce, 1986), Rowlands et al. (1980) suggested that poor fertility was unrelated to cholesterol concentration.

The figure regarding an association between the persistently lower levels of albumin, globulin and A/G ration around calving and delayed onset of postpartum cyclicity could not be explained, perhaps it may be related to gonadotrophins secretion.

CONCLUSION

The high significant ($P<0.01$) negative correlation between serum levels of urea, albumin as well as A/G ratio and calving-conception interval gives the possibility to use the levels of such parameter before calving as a predecting measure for subsequent fertility.

Delayed onset of cyclicity after calving could be a common sequel for inadequate energy balance and/or persistently lower levels of albumin, globulin and A/G ratio around calving.

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Table (1) : Serum biochemical analysis in relation to postpartum fertility. *

Serum parameters	*Animals*					
	Group I (n = s)		*Group II (n = 8)*		*Group III (n = 2)*	
	Antepartum	**Postpartum**	**Antepartum**	**Postpartum**	**Antepartum**	**Postpartum**
Glucose (mmoL/L)	2.5 ± 0.47^{a}	2.93 ± 0.43^{d}	2.49 ± 0.43	2.47 ± 0.52^{f}	1.75 ± 0.24^{e}	1.61 ± 0.38^{f}
Urea (mmoL/L)	5.37 ± 0.72^{a}	4.06 ± 0.76^{d}	4.35 ± 1.00^{e}	4.00 ± 1.25	3.65 ± 1.24^{e}	3.05 ± 0.88^{f}
Cholesterol (mmoL/L)	2.5 ± 0.69^{a}	3.00 ± 0.49^{d}	2.36 ± 0.62	2.16 ± 0.86^{f}	1.6 ± 0.14^{b}	1.69 ± 0.56^{f}
Total protein (g/dL)	4.81 ± 1.06	8.46 ± 0.85	8.14 ± 0.89	8.14 ± 1.25	7.6 ± 1.2	8.40 ± 1.11
Albumin (g/dL)	4.3 ± 0.34^{a}	4.01 ± 0.48^{d}	3.5 ± 0.48^{e}	3.78 ± 0.53^{e}	2.3 ± 0.42^{e}	2.35 ± 0.30^{f}
Globulin (g/dL)	4.11 ± 0.76^{a}	4.39 ± 0.57^{d}	4.72 ± 1.09	4.38 ± 1.11	5.42 ± 0.98^{e}	6.13 ± 1.02^{f}
A / G ratio	1.07 ± 0.15^{a}	0.92 ± 0.13^{d}	0.79 ± 0.26^{e}	0.64 ± 0.35	0.44 ± 0.09^{e}	0.40 ± 0.07^{f}

* **Group I** : In which days open average 104.2 ± 9.5

Group II : In which days open average 158.75 ± 20.16

Group III : In which no cyclic activity till 210 days postpartum.

Different superscripts (a - c), (d - f), mean highly significant differences ($P < 0.01$).
Different superscripts (a - b), (d - e), mean significant differences ($P < 0.05$).

Table (II) : Correlation coefficients and levels of significance for the correlatons between periparturient serum parameters and postpartum fertility.

Serum parameters	*Antepartum*	*postpartum*
Glucose	- 0.24 ns	- 0.78 **
Urea	- 0.73 **	- 0.37 ns
Cholesterol	- 0.49 ns	- 0.44 ns
Total protein	- 0.07 ns	0.49 ns
Albumin	- 0.81 **	- 0.63 *
Globulin	0.58 *	0.46 ns
A/G ratio	- 0.76**	- 0.49 ns

ns : not significant ($P > 0.05$).
* : significant ($P < 0.05$).
** : highly significant ($P < 0.01$).