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EFFECT OF MATING SEASON AND STAGE OF PREGNANCY ON PLASMA ALDOSTERONE AND SOME MAJOR ELEMENTS IN BARKI EWES.

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ABSTRACT: Plasma aldosterone, potassium (K), sodium (Na) and calcium (Ca) were determined during stages of pregnancy in thirty Barki sheep, divided into two equal groups according to mating season (i.e. summer versus winter). Aldesterone was elevated from day of mating to days 75 of gestation, thereafter it steadily increased ($P<0.01$) until 135 days of gestation. Level of potassium exhibited a slight increase in summer than that in winter on day 15 and day 90 of gestation. However, it remained almost similar for both groups till the 60 days of gestation, slightly increased on day 75 then progressively declined till lambing. The changes between the two season groups were slight and not significant. Mating season had nosignificant effect on sodium value. Plasma sodium level was not changed from mating until day 75 of pregnancy, then the concentration of sodium was decreased up to the day of parturition. A remarkable decline in plasma calcium level was noticed from mating to late of pregnancy in the two experimental groups. The reduction in plasma concentrations of Na, K and Ca during pregnancy stress, which may be a mechanism to reduce the loss in K during pregnancy may be associated with bone formation of the fetus.

INTRODUCTION

Changes in aldosterone concentration in the maternal peripheral blood during pregnancy and parturition have been extensively studied in several species. Pregnancy increases aldosterone level in the ewes (Boulfekar and Brudieux 1980 and Okab et.al. 1992) and in goats (Thorburn, et.al. 1980 and Ashour 2001). Aldosterone is by far the most important hormone regulating sodium, potassium and water metabolism (Martin 1978). Minerals play an important role in animals by increasing the efficiency of livestock production and reproduction (Newar, et.al. 1999). The minerals in blood perform a multiple of functions such as, structure of bone, absorption of nutrients, activation of enzyme systems, secretion of hormone and biosynthesis of various bimolecular (Parhak and

Jankiraman 1989, Manzoor, et.al. 1994, Khalil, 2001 and Badr 2001). Furthmore, the concentration of mineral metabolites in the blood varies with different physiological stages of the animals such as pregnancy and parturition (Parker and Blowey 1976 and Abdel All, et.al. 1990). Pregnancy and parturition blood calcium level have been widely discussed (Manzoor, at.al. 1994, Kaushik and Bugalia 1999 and Ashour 2001).

Blood soduium and potassium concentrations changed during pregnancy (Boulfekhar and Brudieux 1980 and Ashour 2001). Meanwhile, Abd El-Rahman (1998) and Ashour (2001) reported that calcium level decreased with advanced Pregnancy. The present study, aimed to investigate the effect of mating season on aldosterone and some major elements in blood during pregnancy and at parturition in Barki ewes.

MATERIALS AND METHODS

This study was run out in the sheep research farm of the animal production department, faculty of agriculture, Al-Azhar University Nasr city Cairo Egypt. A total number of thirty Barki sheep were divided into two equal groups. The group first was mated in summer (June-July), mean while the second mated in winter (February). Animals were housed in semi-open pens throughout the experiment, which provided reasonable shade and ventilation in summer and protection from rain and wind in winter. During the experimental period, the under shade maximum recorded air temperature was 32°C during summer and 18°C during winter. Average monthly relative humidity was 75% during summer and 40% during winter.

Blood samples were taken early in the morning before feeding and watering by jugular vein puncture, on day of mating. Then every two weeks until 135 days of pregnancy and on day of parturition. Blood was centrifuged and the plasma was carefully removed and kept frozen at -20°C until analysis. Plasma aldosterone concentration was measured using the radioimmunoassay (RIA) technique with no extraction as described by Yallow and Berson (1971). RIA Kits (Diagnostic Products Corporation, Los Anglos, CA, USA) were used. Determination of sodium and potassium were conducted according to Henry et al. (1974) and calcium according to Gitelman (1967).

Statistical analysis was carried out using GLM procedure of SAS

(1988). Least square method was used to compare the biweekly means of the different plasma items under consideration.

RESULTS AND DISCUSSION

Effects of mating season and stages of pregnancy on plasma aldosterone concentrations are shown in figure (1). The level of aldosterone was unchanged from day of mating to the 75 days of gestation. Thereafter, it significantly increased ($P<0.01$) with the advance of gestation reaching its maximum level at 135 days of gestation. At parturition level of aldosterone showed unsignificantly decrease.

The results of the present study are similar to those reported by Boulfekar and Brudieux (1980) in ewes and by Ashour (2001) in goats. Okab, et.al. (1992) and Ashour (2001) found that aldosterone level increased gradually as gestation advanced and was significantly higher during mid and late of pregnancy than early pregnancy, in ewes and in goats, respectively. Okab, et.al. (1992) suggested that the rise in aldosterone level during mid and late of pregnancy was due to the reduction in sodium and potassium during such periods.

Boulfekar and Brudieux (1980) reported that level of plasma aldosterone was consistently higher during the second part of pregnancy in the Tadmit ewes. They suggested that the increase in aldosterone level could not result from an increase in the secretion rate of adrencocrticotrophin (ACTH), because the level of cortisol was not higher during this prriod. However, this argument assumes that there in no change in the adrenal or hypothalamic thresholds for ACTH and/or cortisol. The factors, which could be responsible for the rise of aldosterone, may be due to a modification in electrolyte balance, and increases in the levels of renin and angiotensin and production of progesterone and oestrogen.

In this study,. our main objective was to investigate the possible effect of mating season and stage of pregnancy on the potassium, sodium and calcium level in Barki ewes. Few studies have investigated the effect of mating season and stages of pregnancy on the plasma elements level in animals. Plasma potassium was slightly fluctuated during the experimental period regardless the season of mating in the summer mating showed an increase on day 15. Potassium was remained almost similar till the 60 days of gestation, and day 90 of gestation, as compared to that in winter. The potassium value tended to be unchanged during the

first 60 days in both groups. Thereafter, it decreased up to parturition (Figure1).

Boulfekhar and Brudieux (1980) working on ewes reported a slight increase in potassium concentration in blood during the first 45 days of pregnancy followed by a decrease till parturition. Ashour, (2001) found the concentration of potassium exhibited a slight increase between day of mating and 4th week of gestation, then it remained almost constant till the 14th week and thereafter it declined till parturition. Saxena, et.al. (1985) reported that, the effect of pregnancy on blood electrolytes was not significant. The decrease in potassium concentration during late pregnancy could be attributed to the increase in aldosterone before parturition. This controls the absorption of sodium and excretion of potassium, due to hyperactivity of the adrenal cortex. Yokus, et al. (2004) recorded that the potassium level in sheep was found to be the lowest in July. These results may suggest that the potassium level varied with both physiological and seasonal variations.

Figure (1) further indicates that sodium concentration was almost similar in both mating groups. It remained unchanged during the first 90 days of pregnancy, followed by a remarkable decrease towards parturition. Stage of pregnancy and mating season had no significant effect on sodium concentration. The present finding is in close agreement with those found by Rowlands, et.al. (1975), Okab, et.al. (1992), Badr, (2001) and Ashour, (2001). On the other hand, Yokus, et.al. (2004) found that sodium level was lowest during early pregnancy and during July month. Boulfekhar and Brudieux (1980) reported that sodium reduced slightly until 45 days after mating then remained steady until three days before parturition. The decrease in sodium level with advancing pregnancy can be attributed either to amount of water intake and or losses of sodium during this period (EL-Naggar and Mottelib 1979) or due to the influence of thermo-environmental factors (Abd El-All, et.al. 1990).

The decrease of sodium concentration during late of pregnancy and at parturition can be attributed to a concomitant increase in the level of aldosterone. Okab, et.al. (1992) suggested that the rise in aldosterone during mid and late of pregnancy was due to the reduction in sodium during this period. In addition, the marked reduction in sodium level in blood could be a result of elevation of the rennin angiotensin aldosterone system, which is activated when sodium is deficient (Ashour, 2001).

Effect of mating season and stages of pregnancy on calcium concentration is illustrated in figure (1). A gradual decline in calcium was noticed from mating to late of pregnancy. The rate of decrease was slight and not significant during the early stages of pregnancy and also between the two mating seasons. The results are in agreement with yhose reported by Tainuturier, et.al. (1984), Abd El-Rahman, (1998), Kauskik and Bugalia (1999), Ashour, (2001), and Ribeiro, et.al. (2004). Decrease in calcium level was noticed during late of pregnancy. Calcium metabolism is essential for mineralization of fetus skeleton during late of pregnancy (Badr 2001). Horst (1986) showed that bone calcium and phosphorus in support of plasma calcium and phosphorus level are under the influence of both vitamin D and parathyroid hormone (PTH) which are needed for bone calcium and phosphorus resorption.

The reasons for the decrease in calcium level from early of pregnancy and towards parturition in the present study ,can be discussed according to Pickard (1976) who stated that one of the major factors influencing the incidence of milk fever (due to decrease of calcium during late of pregnancy) is the intake of calcium around the time of parturition. When the intake of calcium has been kept constant at a low level during dry period and increased just prior to calving, the fall in plasma calcium is minimized.

Rowlands, et.al.(1975) and Nordin (1976) found that a significant fall in calcium level in late of pregnancy, may be due to an increase of estrogens and adrenal corticoid hormones causing hypocalcaemia effect during the late of gestation period, this was confirmed by Ferrel, et.al.(1982). In goats, Ashour (1998) recorded that the decrease in calcium level during late of pregnancy was attributed to two factors, the first is hormonal effect and this state it could be considered as physiological homeostasis and the second is the huge requirement of calcium for milk initiation and production. In ewes, Antunovic, et.al. (2001) found that concentration of calcium was significantly higher in summer than in winter during late of pregnancy. A statistically significant decrease was found on day 100 of pregnancy for calcium level in Akkaraman sheep (Yildiz,et.al. 2005). It is concluded that the reduction in plasma concentration of aldosterone, Na, K and Ca during pregnancy stress, which may be a mechanism to reduce the loss in K during pregnancy especially through sweating.

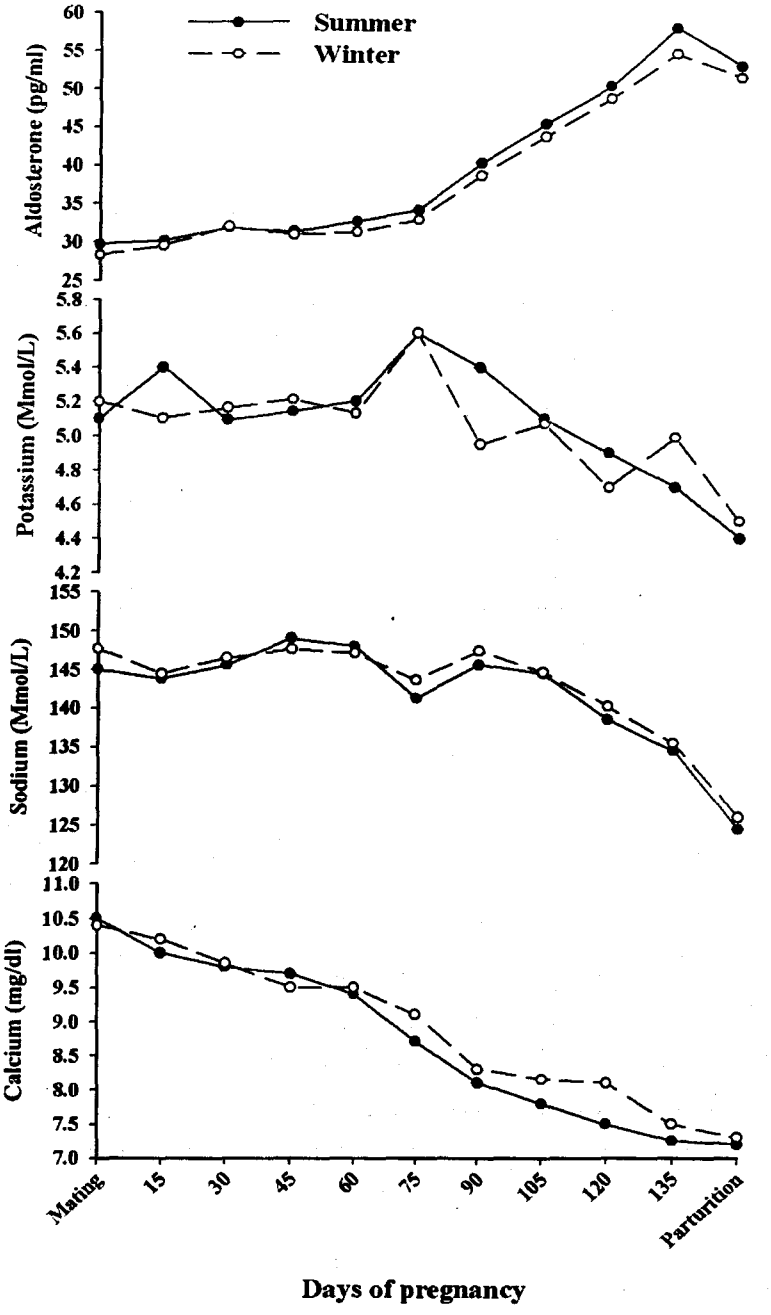

Figure (1): Effect of mating season and pregnancy stages on aldosterone hormone, potassium, sodium and calcium concentrations.

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تأثير موسم التقليح ومراحل الحمل علي الالدرستيرون وبعض العناصر الرئيسية في النعاج البرقي

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في هذه الدراسة تم تقدير مستويات كل من هرمون الالدوستيرون والبوتاسيوم والصوديوم والكالسيوم في الدم لثلاثين نعجة برقي قسمت مجموعتين متساويتين الأولى لقحت في الصيف والثانية لقحت في الشتاء . ارتفع تركيز الالدوستيرون إرتفاعا غير معنويا من يوم التلقيح وحتى اليوم الـ ٧٥ من الحمل ثم يزيد زيادة معنوية حتى اليوم الـ ١٣٥ من الحمل . كان تركيز البوتاسيوم أعلى بدرجة طفيفة في الصيف عن الشتاء من يوم التلقيح وحتى اليوم ١٥ من الحمل . ثم يبقى شبه ثابت حتى اليوم ٦٠ من الحمل ، ثم يزيد على اليوم ٧٥ من الحمل، ثم يقل باتجاه نهاية الحمل وحتى الولادة.

موسم التلقيح كان تأثيره غير معنوي على تركيز الصوديوم بالدم ولكن كان يتغير بدرجة طفيفة من التلقيح وحتى اليوم ٧٥ من الحمل، ثم ينقص تركيز الصوديوم عند الولادة . وكان هناك نقص متدرج في مستوى عنصر الكالسيوم من يوم التلقيح وحتى نهاية الحمل في كلا المجموعتين . الانخفاض في مستويات هرمون الالدوستيرون والصوديوم والبوتاسيوم والكالسيوم أثناء مراحل الحمل ربما راجع إلى انخفاض البوتاسيوم أثناء الحمل خصوصاً أثناء العرق .