

Serum progesterone analysis for monitoring estrus, pregnancy and parturition in Shami goats

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Abstract

Serum progesterone profiles during estrus phase, gestation period and parturition in twenty female Shami goats (*Capra hircus*) aged 2-3 years were monitored. Estrus was synchronized by intra-vaginal sponges (containing 60 mg of medroxy progesterone acetate (MPA)) kept for 14 days followed by intramuscular injection of 300 IU of pregnant mare serum gonadotropin (PMSG) immediately after sponges withdrawal. Does were monitored for signs of estrus by means of an apronized detector buck. Those which came into estrus were hand-mated to known fertility bucks. Following the service, blood sampling was carried out at day 0 (at estrus phase) then weekly till parturition. Serum was isolated and utilized for progesterone assay. Progesterone was assayed by radioimmunoassay (RIA) methods. Observation regarding the length of gestation and litter size were recorded. Results were indicated that the monthly gestation, means of progesterone concentration were (4.8±0.70, 5.85±0.88, 8.95±0.72, 9.15±0.33 & 4.37±0.23) ng/ml in 1st, 2nd, 3rd, 4th and 5th months of pregnancy respectively. Monthly progesterone concentration in does bearing single fetus for the above mentioned months of pregnancy were (4.1±0.33, 5.0±0.21, 7.1±0.49, 7.5±0.69, and 2.05±0.31) ng/ml respectively, while in those bearing twin were (5.8±0.36, 6.2±0.42, 10.0±0.21, 9.9±0.28, and 6.5±0.62) ng/ml respectively. In conclusion, the progesterone assay proved to be a reliable method for detection of estrus and early pregnancy and predicting litter size and parturition date.

Key words: Serum progesterone, estrus, detection of pregnancy, parturition, goats.

استخدام تحليل مستوى البروجستيرون في مصل الدم لمراقبة الشبق والحمل والولادة في الماعز الشامي

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الخلاصة

جرى مراقبة صورة هورمون البروجستيرون في مصل الدم خلال فترات الشبق والحمل والولادة في 20 من اناث الماعز الشامي تراوحت اعمارها بين 2-3 سنوات. اجريت مزامنة الشبق باستخدام الاسفنجات المهبلية الحاوية على 60 ملغم من مردوكسي بروجستيرون استيت لمدة 14 يوم ، و 300 وحدة دولية من هرمون محرض القند للفرس الحامل (PMSG) حققت بالعزل مباشرة بعد سحب الاسفنجات المهبلية. رصدت علامات الشبق باستخدام ذكر الماعز الكشاف. الاناث التي اظهرت علامات الشبق جرى تسفيدها من ذكور الماعز و جمعت عينات الدم بعد التسفيد (اليوم صفر (في طور الشبق)) ثم اسبوعيا لحين الولادة. عزل مصل الدم وجرى التحري عن هورمون البروجستيرون بطريقة التحليل المناعي الشعاعي (RIA) ، كما سجل أيضا طول فترة الولادة وحجم الوليد. اشارة النتائج الى ان معدل تركيز هرمون البروجستيرون الشهري كان (4.8±0.70 ، 5.85±0.88 ، 8.95±0.72 ، 9.15±0.33 ، 4.37±0.23) نانو غم/مل في الشهر الاول والثاني والثالث والرابع والخامس من الحمل على التوالي. وكان تركيز الهرمون لأشهر الحمل الخمسة في الاناث الحوامل بجنين واحد (4.1±0.33 ، 5.0±0.21 ، 7.1±0.49 ، 7.5±0.69 ، 2.05±0.31) نانو غم/مل على التوالي ، بينما كانت في الاناث الحوامل بتوائم (5.8±0.36 ، 6.2±0.42 ، 10.0±0.21 ، 9.9±0.28 ، 6.5±0.62) نانو غم/مل على التوالي. نستنتج ان طريقة تحليل هرمون البروجستيرون اثبتت انها طريقة يعول عليها في الكشف عن الشبق ، والحمل المبكر ، والكشف عن حجم الوليد وموعد الولادة.

الكلمات المفتاحية: البروجستيرون ، الشبق ، الكشف عن الحمل ، الولادة ، الماعز.

Introduction

Detection of early pregnancy is necessary for efficient goat production. An accurate method for pregnancy diagnosis and predict single and multiple births may increase management level and culling non pregnant does at an early time of the breeding season (1). Pregnancy diagnosis in woman can be made as early as 21 days after conception by detection plasma gonadotropin (2). (3) detected the presence of pregnant mare serum gonadotropin in the blood at 37 days of pregnancy and developed an early pregnancy test for mares. A reliable method to detect pregnancy factor was established on measuring progesterone level at fixed times during pregnancy in which peripheral blood progesterone level remains elevated at the expected return to estrus between 15-21 days after mating (4). It had been found that does in estrus had very low progesterone level and this level increased on day 6 of the cycle and reached the peak value on day 12 then decreased sharply at day 15 of the cycle in non-pregnant does while remained elevated in pregnant does (5). (6) used fecal progesterone determination for accurate pregnancy diagnosis at 19-21 days after mating. Serum progesterone level has been used to detect pregnancy in goats at 21-24 days post breeding (7). Progesterone concentration in the blood was decrease sharply during regression of the corpus luteum (CL) in the non-pregnant doe and return to higher levels within four days following estrus (8). The pregnant doe has high progesterone concentration during the same time period since the CL does not regress (9). Progesterone testing in goats is recommended on day 21-24 post breeding. Reproduction is a major factors contributing to the efficiency of meat and milk production. Many genetic, environmental and physiological factors affect the reproductive efficiency of the female goats. Assessment of progesterone level during different physiological stages in animals is considered one of the most important parameter to determine their fertility status (10). In view of this and since little information is available regarding progesterone profile during different physiological status such as

pregnancy and estrus in shami goats, the present study was conducted.

Materials and methods

Twenty Shami does of almost similar age (2-3) years weighing (20-30) kg were selected and maintained at Agurguf goat station. The does were housed in large status in groups of five does each. They were flushed and received green feed of alfa alfa. Each doe was examined thoroughly for apparent reproductive problems and pregnancy. All does received two injections of prostaglandin F2 alpha analogue (7.0 mg Luprostiole®) at 10 days interval to terminate pregnancy. Does were checked for signs of estrus by a teaser apronized buck for three times daily and inspected for any vaginal discharge. Estrus was synchronized by using intra-vaginal sponges impregnated in 60 mg of medroxy progesterone acetate (MPA) kept for 14 days and received an intramuscular injection of 300 IU of pregnant mare serum gonadotropin (PMSG) immediately after removal of sponges. Does that showed estrus signs with cloudy vaginal discharge were selected for mating with two bucks of known fertility. Blood samples obtained from the jugular vein of the does at day 0 (during estrus) before mating, then weekly till parturition. Serum was isolated and frozen at (-20c°) then assayed for progesterone by radioimmunoassay (RIA). All does remained under observation for return to estrus and pregnancy until parturition.

Results

Treatment with prostaglandin F2 α revealed that none of the treated animals were pregnant. Since no signs of abortion or parturition were observed. Estrus was observed in all the twenty does within four days after synchronization. None of the does returned to estrus after mating. Progesterone levels were low during estrus with significant rise after conception. Higher progesterone values (4.37-9.15) ng/ml were maintained through the gestation period and declined rapidly during 14 days prepartum reaching

(0.5-1) ng/ml on the day of parturition (Fig.1). The mean maximum progesterone level during gestation was (9.15) (Table 1). Pregnancy was confirmed by kidding at the end of the experiment when half of the group (10 goats) had single birth and the other half (10 does) had twins births. According to

progesterone level as shown in (Table 2) reflected significant differences between single and twin pregnancies for the period assayed. Regarding gestation length the result of this study revealed that mean gestation length in Shami goat was 145.5 ± 2.80 days.

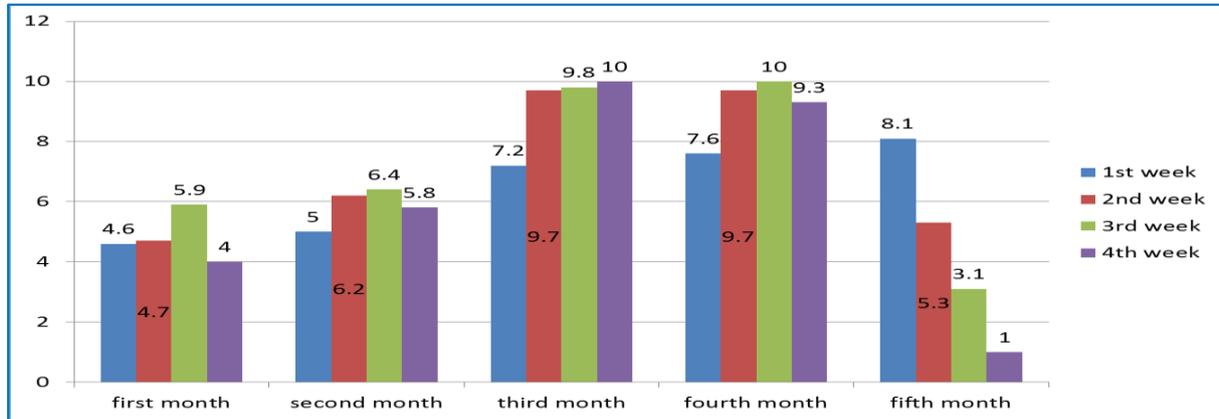


Fig. (1): Progesterone levels (ng/ml) during pregnancy (in weeks) of Shami goats.

Table (1): Progesterone levels (ng/ml) during pregnancy months of Shami goats.

Months	1 st month	2 nd month	3 rd month	4 th month	5 th month
Means \pm S.E.	4.8 ± 0.70 a	5.85 ± 0.88 a	8.95 ± 0.72 b	9.15 ± 0.33 b	4.37 ± 0.23 d

Small letters represent presence of significant differences at level of $P < 0.01$.

Table (2): Progesterone levels (ng/ml) with single and twin's pregnancy months of Shami goats (Numbers are represent mean \pm SE).

Months Type of birth	1 st month	2 nd month	3 rd month	4 th month	5 th month
Single	4.1 ± 0.33 b	5.00 ± 0.21 b	7.10 ± 0.49 c	7.50 ± 0.69 c	2.05 ± 0.31 a
Twin	5.80 ± 0.36 a	6.30 ± 0.42 a	10.0 ± 0.21 b	9.90 ± 0.28 b	6.50 ± 0.62 a

Small letters represent presence of significant differences at level of $P < 0.01$.

Discussion

Iraqi goats are seasonally poly estrous and thus it can breed around the year (11 and 12). The necessity of measuring reproductive hormones in goats at different time of the year to determine seasonal and pregnancy effects (13). This information is required in order to increase reproductive efficiencies (14). The metabolic and functional changes between conceptions to termination of pregnancy are brought about by the interaction of various hormones mainly the progesterone hormone, the corpus luteum is the only source of progesterone for the

maintenance of pregnancy in goats (1). So that the corpora lutea (CL) are essential for maintaining pregnancy throughout gestation (8 and 9). Maintenance of corpus luteum function depends on the maternal pituitary, and placental lutotrophin (13). A luteotropic rate has been suggested for placental lactogen, which increase late in gestation (15). Maternal serum progesterone concentrations are positively correlated with the number of Corpora lutea (1). Goats potentially are highly prolific due to high numbers of ovulations and multiple births

(8). Therefore a significant positive correlation was observed between progesterone concentration and the number of kids born (7). The pattern of progesterone levels during pregnancy is changeable; it is low from mating and increases noticeably by the 3rd week and remains high until the 19th week (9). This is in accordance with the results of our recent study. The progesterone concentration was significantly ($p < 0.01$) greater in twin bearing goats than single bearing goats, which is in agreement with (16). This difference was probably due to the number of corpora lutea present as it is the source of progesterone in goats (8). (16) reported almost twice higher maternal serum progesterone concentration during last two months of gestation period for twins was almost twice as compared to single bearing goats. While (17) did not find any significant effect of number of fetuses on maternal

progesterone concentration in goats. (18) reported the progesterone levels rise from 5ng/ml to 33ng/ml during 3rd months of pregnancy in doe. Also, progesterone was found to rise to 17ng/ml by second months and maximal level was 21ng/ml at last month of pregnancy (19). (13) referred higher level of progesterone during goat pregnancy than that which reported in our work. It is useful means for early diagnosis of date of does birth that have become near parturition depending upon the decreasing of progesterone hormone. In conclusion, the results of this experiment indicated that measurement of blood progesterone levels in does can be used for determination of estrus and pregnancy and also it can be used to discriminate between single and twin pregnancies and also predict date of parturition.

References

- 1-Khan JR Ludri RS (2002) Hormonal profiles during periparturient period in single and twin fetus bearing goats. *Asian-Australian Journal of Animal Science*, 15 (3): 346-351.
- 2-Sugantha SE, Webster S, Sundar E Lenton EA (2000) Predictive value of plasma human chorionic gonadotrophin following assisted conception treatment. *Human Reproduction*, 15 (2): 469-473.
- 3-Fay JE, Douglas RH (1982) The use of radioreceptor assay for the detection of pregnancy in the mare. *Theriogenology*, 18 (4): 431-444.
- 4-Fleming SA, Van Camp SD, Chapin HM (1990) Serum progesterone determination as an aid for pregnancy diagnosis in goat bred out of season. *Canadian Veterinary Journal*, 31: 104-107.
- 5-Khanum SA, Hussain M Kausar R (2008) Progesterone and estradiol profiles during estrus cycle and gestation in Dwarf goats (*Capra hircus*). *Pakistan Veterinary Journal*, 28 (1): 1-4.
- 6-Jack AMM, Chang CC, Peh HC, Chan JPW (2012) Fecal progesterone analysis for monitoring reproductive status in dairy goats. *Turkish Journal of Veterinary Animal Science*, 36 (5): 566-572.
- 7-Boscós CM, Samartzi FC, Lymberopoulos AG, Stefanakis A, Belibasaki S (2003) Assessment of progesterone concentration using enzyme immunoassay, for early pregnancy diagnosis in sheep and goats. *Reproduction in Domestic Animal*, 38 (3): 170-174.
- 8-Jarrell VL, Dzink PJ (1991) Effect of number of corpora lutea and fetuses on concentration of progesterone in blood of goats. *Journal of Animal Science*, 69: 770-773.
- 9-Kandiel MMM, Watanabe G, Sosa GA, Abou El-Roos MEA, Abdel-Gaffar AE, Li JY, Manabe N, El-Azab AI, Taya K (2010) Profile of circulating steroid hormones, gonadotropins, immunoreactive inhibin and prolactin during pregnancy in goats and immunolocalization of inhibin subunits, steroidogenic enzymes and prolactin in the corpus luteum and placenta. *Journal of Reproduction and Development*, 56 (2): 243-250.
- 10-Zarkawi M Soukouti A (2001) Serum progesterone levels using radioimmunoassay during oestrous cycle of indigenous Damascus does. *New Zealand Journal of Agriculture Research*, 44: 165-169.
- 11-Abd-Al-Rahman LY (1998) Certain Reproductive Characteristics of Females Local Goats. Ph. D Thesis College of Veterinary Medicine - Baghdad University.
- 12-Alwan AF (1998) Gross abnormalities affected females genital tracts of Iraqi ruminants. *The Veterinarian*, 8 (2): 23-29.
- 13-Alwan AF, Amin FAM Ibrahim NS (2010) Blood progesterone and estrogen hormones level during pregnancy and after birth in Iraqi sheep and goat. *Basra Journal of Veterinary Research*, 10 (2): 153-157.
- 14-Jainudeen MR, Wahid H, Hafez ESE (2000) Sheep and Goats. In: Reproductions in Farm Animals. ESE Hafez and B Hafez. 7th ed. Lippincott William and Wilkins Philadelphia, USA.
- 15-Noakes DE, Parkinson TJ England GC (2008) *Arthur's Veterinary Reproduction and Obstetrics*. 8th ed. Elsevier Limited, China.
- 16-Manalu W, Sumaryadi MY Kusumorini N (1996) Effect of fetal number on concentration of

- circulation maternal serum progesterone and estradiol of does during late pregnancy. *Small Ruminant Research*, 23: 117-124.
- 17-Kaushik HK, Bugalia NS, Khar SK, Rana ZS (1992) Plasma progesterone and estradiol-17 β profiles during pregnancy in goats. *Recent advances in goat production Proceeding. 5th International Conference on Goats*. PP: 1299-1308.
- 18-Roberts SJ (1986) *Veterinary Obstetrics and Genital Diseases (Theriogenology)*. 3rd ed. Author Wood Stock, New York, USA.
- 19-Pineda MH (2003) Female reproductive system. In: *McDonalds Veterinary Endocrinology and Reproduction*. MH Pineda and MP Dooley. 5th ed. Iowa State Press USA, PP: 435-437.