

Concentrations of Plasma Oestradiol-17 β , Progesterone and Cortisol in Pre-and Postpartum Stages of Arabian She-Camel (*Camelus dromedarius* L.)

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ABSTRACT. The present investigation was conducted to estimate the oestradiol-17 β (E₂), progesterone (P₄) and cortisol profile in the Arabian she-camel (*Camelus dromedarius* L.) pre-and postpartum. Five pregnant Arabian she-camels were used. Blood samples were collected on 42, 35, 28, 21, 14, 7, 6, 5, 4, 3, 2, 1 days pre-and postpartum and on the day of parturition. The plasma was stored at -20 °C till use. The E₂ concentration has increased significantly from day 42 prepartum (755 \pm 104 pmoll⁻¹) to day 3 prepartum (1540 \pm 460 pmoll⁻¹), before decreasing on the day of calving (28.0 \pm 12 pmoll⁻¹) and remained low thereafter. The P₄ concentration has decreased (p < 0.01) from day 42 prepartum (16.0 \pm 4.0 nmoll⁻¹) to day 2 prepartum (8.0 \pm 2.5 nmoll⁻¹) and remained low without any major fluctuations. Cortisol concentration was little changed from day 42 prepartum (27.5 \pm 3.2 nmoll⁻¹) to day 2 prepartum (52.5 \pm 8.0 nmoll⁻¹). However, it has increased on day one prepartum (860 \pm 17.3 nmoll⁻¹) and peaked on the day of parturition (112.32 \pm 12.7 nmoll⁻¹), before decreasing thereafter. The results showed that E₂ and the cortisol levels have increased sharply before parturition which might confirm their role in triggering parturition in the camel. While the decline of P₄ seems to be required for the initiation of parturition too. It could be concluded that together with other parameters, oestradiol-17 β , progesterone and cortisol may be used as good indicators to predict the time of parturition in the Arabian she-camel.

Parturition is triggered by the foetus and is complemented by a complex interaction of endocrine, neural and mechanical factors, but their precise roles and interrelationships are not fully understood (Jainudeen and Hafez 1993, and Challis

1996). A number of important hormonal changes have been reported pre- and postpartum in several domestic animals (Thorburn and Challis 1979). Those hormonal changes are very useful tools to monitor pregnancy, and may contribute to good management and an improvement in the survival rate of the progeny. Little research has been reported on these hormones in the Arabian camel (*Camelus dromedarius* L.) Therefore, the patterns of variations in the levels of oestradiol-17 β (E₂), progesterone (P₄) and cortisol in the Arabian she-camel have been monitored during pre- and postpartum periods in the present study.

Materials and Methods

Five healthy pregnant Arabian she-camels 8 to 12 years of age were housed together in an open shaded barn (about 10 x 30 m) at the farm of the Animal Production Department, College of Agriculture, King Saud University in Riyadh, Saudi Arabia. They were fed on concentrates and roughages. The former was containing 13.4% digestible protein and 72% total digestible nutrients, while the latter was alfalfa. Water and salt licks were provided *ad libitum*. Blood samples were collected from the jugular vein on the following days 42, 35, 28, 21, 14, 7, 6, 5, 4, 3, 2, 1 pre- and postpartum and on the day of parturition. Plasma was immediately separated in a refrigerated centrifuge and stored at -20 °C until assayed. P₄, E₂ and cortisol concentrations were measured by a direct solid phase ¹²⁵I radioimmunoassay (RIA) method (Coat-A-Count TKPG, TKE and TKCO; Diagnostic Product Corporation, Los Angeles, CA, U.S.A.) according to the manufacturer's methods with slight modifications in assaying E₂ (Bever and Dieleman 1987). The main cross reactants for P₄ were 2.4, 2.0, 1.7, 1.3 and < 1.0 % for 11-Deoxycortisol, Dihydroprogesterone, 11-Deoxycorticosterone, 5-Pregnane-3,20 dione and other steroids, respectively, and for E₂, 10.0, 4.4, 1.8, 1.8 and < 1.0 % for Oestrone, D- equilenin, Oestrone- β -D-glucuronide, Oethinylestradiol and other steroids, respectively, and for cortisol, 11.4, 76, 2.3 and < 1.0 % for 11-Deoxycortisol, Prednisolone, Prednisone and other steroids, respectively. The intra-assay coefficient variance (CV) was 4.7, 5.6 and 8.5 % and the inter-assay CV was 8.0, 6.5 and 9.6 for P₄, E₂ and cortisol, respectively. The data were statistically analysed at the King Saud University Computer Center using the General Linear Models procedure of the Statistical Analysis System (Goodnight *et al.* 1985).

Results

Since there were high variations between individuals in hormonal profiles, E₂, P₄ and cortisol concentrations for each female are presented, together with the overall mean of all five females.



The E_2 concentrations have increased in all females from day 42 prepartum and have peaked at day 3, 7, 5, 5 and 6 before parturition in females 1, 2, 3, 4 and 5, respectively. The levels have then decreased in all animals, to the lowest level on the day of parturition and remained low thereafter (Fig. 1). On the other hand, the P_4 levels have started to decrease prior to parturition on day 28, 14, 28, 42 and 21 in animals number 1, 2, 3, 4 and 5, respectively, then, they continued to decrease, in all animals, reaching low levels on the day of parturition and remained so till the end of the study (Fig. 1). Cortisol level was low in all animals at the beginning of the study, but has started to rise, reaching the highest level at day 5 prepartum in animal number 1, and on the day of parturition in animals number 2 and 5, and at day 1 and 2 postpartum in animals number 3 and 4, respectively (Fig. 1).

The overall mean of E_2 concentration for all 5 she-camels has started to increase significantly ($p < 0.01$) right from day 42 prepartum (755 ± 240 pmol l^{-1}), reaching a peak on day 3 prior to parturition (1540 ± 240 pmol l^{-1}), before declining below detectable level and continued low thereafter (Fig. 1). On the other hand, the overall mean of P_4 concentration for all 5 she-camels has began decreasing from day 21 prepartum, reaching its lowest level (> 3.2 nmol l^{-1}) on the day of parturition and continued low thereafter (Fig. 1). However, the overall mean cortisol concentration for all 5 she-camels has fluctuated considerably over the period of study, but it has peaked (112.3 ± 12.7 nmol l^{-1}) around the day of parturition (Fig. 1).

Discussion

The results showed that P_4 concentration has declined prior to parturition which may facilitate prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$) release from maternal cotyledons (Thorburn and Challis 1979). Similar observations were previously made in the Arabian Camel (El-Wishy *et al.* 1983, Cristofori *et al.* 1986, Agarwal *et al.* 1987, El-Baghdady *et al.* 1990, and El-Belely 1994). However, the timing of the decline differed significantly between the various studies. In this study, the P_4 decline has started 42-14 days before parturition. While, Elias *et al.* (1984) have detected a gradual decrease in P_4 concentration commencing at the sixth month of pregnancy and both Agarwal *et al.* (1987) and El-Baghdady *et al.* (1990) have reported a marked decline during the last month of pregnancy. Furthermore, as in cattle (Parker *et al.* 1988), sheep (Chamley *et al.* 1973) and goats (Currie *et al.* 1988), El-Belely (1994) has observed the decline to begin 66-42 h before parturition. Similar to the observations of both of Elias *et al.* (1984) and of Agarwal *et al.* (1987), E_2 level was observed in the present study to increase during the prepartum period reaching a peak 6-3 days before parturition. Similar to the situation in sheep (Liggins *et al.*

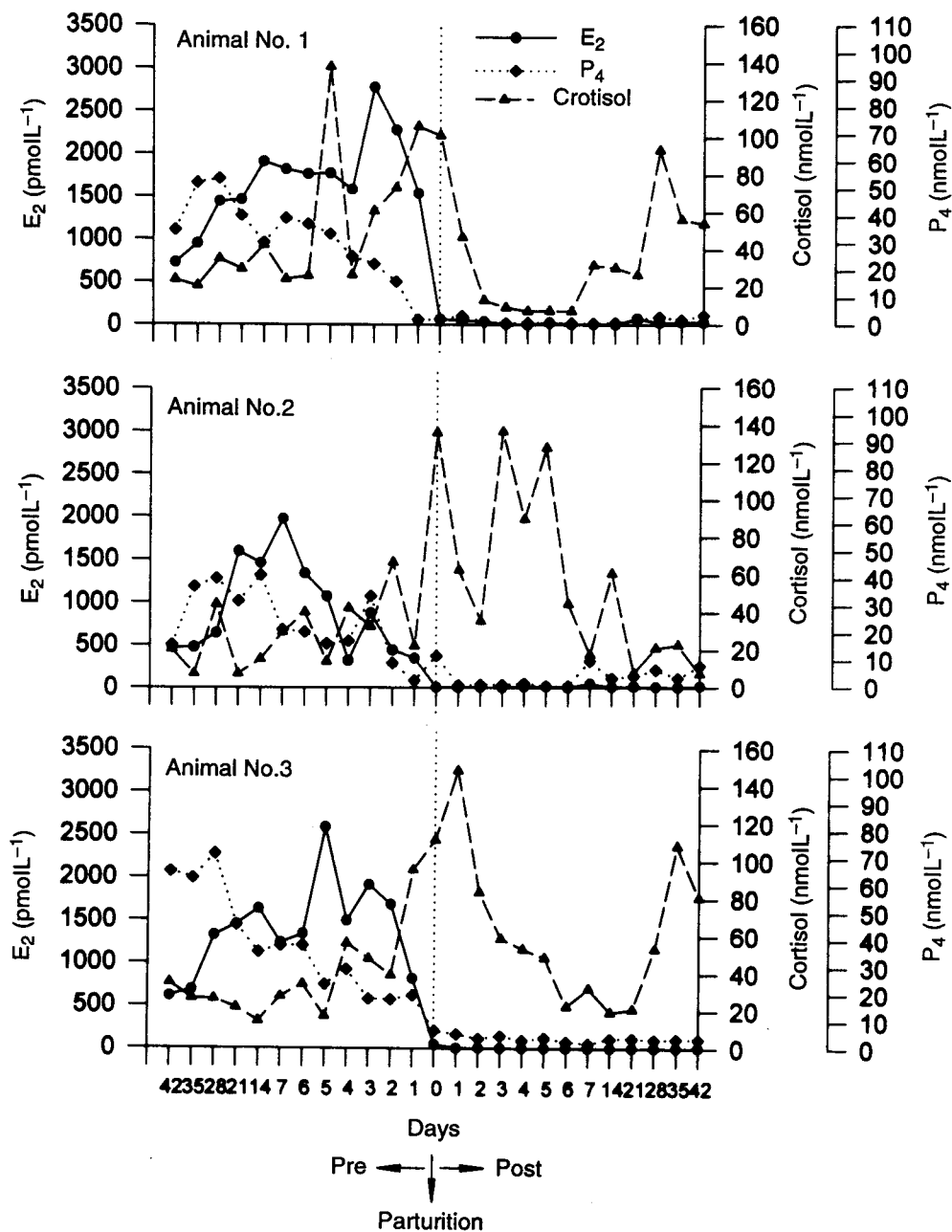
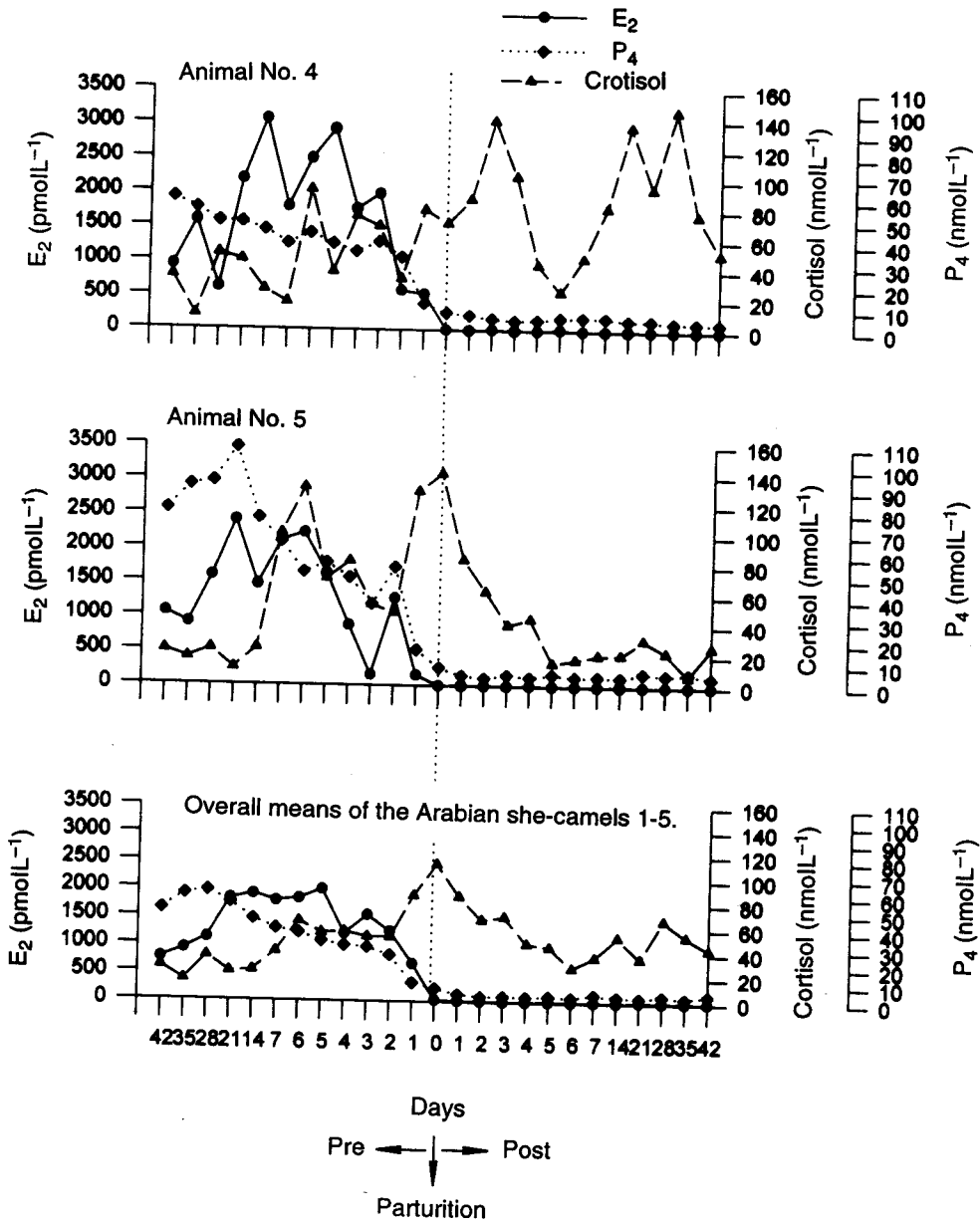


Fig. 1. Oestradiol (E_2), progesterone (P_4) and cortisol concentrations, together with their overall means during pre- and postpartum periods in five Arabian she-camels.



1973) and in goats (Currie *et al.* 1988), such increase in E₂ level could be presumed to reflect hypercorticosteroidism in the maturing foetus that required for the release of PGF_{2 α} . The cortisol level was observed in this study to fluctuate, but it has sustained a high level around parturition. However, substantial variations in cortisol level have been reported during pregnancy and parturition in many domestic animals, including cattle, sheep and goats (Adams and Wagner 1970, Chamley *et al.* 1973, and Smith *et al.* 1973). The high level of cortisol observed around parturition might have arisen due to the fetal pituitary and adrenal axis that secretes increased amounts of cortisol (Adams and Wagner 1970, and Thorburn and Challis 1979) which might play a primary role in determining the time of parturition (Smith *et al.* 1973). Hence, the results of this study do not only provide basic information on some hormone levels around parturition in the Arabian she-camel, but also suggest that oestradiol -17 β , progesterone and cortisol may be utilised as good indicators to predict the time of parturition. However, more studies are required to determine the factors affecting parturition in camels.

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تركيز هرمونات الاستراديول والبروجستيرون والكريتيزول في النوق العربية قبل الولادة وبعدها

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تهدف هذه الدراسة لقياس تركيز الاستراديول والبروجستيرون والكريتيزول في النوق العربية . حيث تم استخدام خمس نوق حوامل وقد جمعت عينات الدم من الوريد الوداجي خلال الأيام ٤٢ و ٣٥ و ٢٨ و ٢١ و ١٤ و ٧ و ٦ و ٥ و ٤ و ٣ و ٢ و ١ قبل وبعد الولادة وفي يوم الولادة . وقد تم حفظ بلازما الدم (بعد فصلها في جهاز طرد مركزي مبرد) عند درجة ٢٠ م تحت الصفر لحين التحليل الهرموني باستخدام طريقة المعايرة المناعية المشعة (RIA) المستخدمة نظائر اليود المشع ١٢٥ . هذا وقد تم تحليل البيانات باستخدام نظام التحليل الإحصائي (SAS) في مركز الحاسب الآلي بجامعة الملك سعود بالرياض . هذا وقد أوضحت النتائج أن متوسط تركيز هرمون الاستراديول زاد معنوياً من اليوم ٤٢ (104 ± 755 بيكومول/ لتر) إلى اليوم الثالث (460 ± 1540 بيكومول/ لتر) قبل الولادة ثم بعد ذلك انخفض في يوم الولادة (12 ± 28 بيكومول/ لتر) واستمر منخفضاً بعد الولادة . أما متوسط هرمون البروجستيرون فإنه انخفض معنوياً من اليوم ٤٢ (4 ± 16 نانومول/ لتر) إلى اليوم الثاني ($2,5 \pm 8$ نانومول/ لتر) قبل الولادة وبقي بعد

الولادة منخفضة وثابتاً دون أي تغيير يذكر . ولقد اظهر متوسط الكرتيزول تغيرات قليلة من اليوم ٤٢ ($٣, ٢ \pm ٢٧, ٥$ نانومول/ لتر) إلى اليوم الثاني ($٨, ٠ \pm ٥٢, ٥$ نانومول/ لتر) قبل الولادة بينما ارتفع مستواه من اليوم الأول ($١٧, ٣ \pm ٨٦, ٠$ نانومول/ لتر) قبل الولادة حيث وصل إلى حده الأقصى في يوم الولادة ($١٢, ٧ \pm ١١٢, ٣$ نانومول/ لتر) ثم بعد ذلك انخفض وظل ثابتاً . هذا وقد دلت النتائج على أن الزيادة الحادة لكل من الاستراديول والكرتيزول وانخفاض البروجسترون قبل الولادة يؤكد دور وأهمية هذه الهرمونات في التنبية لإحداث الولادة . لهذا يمكن استخدام هذه الهرمونات في عملية تحديد موعد حدوث الولادة .