

Factors Affecting Cortisol Status in Camels (*Camelus dromedarius*)

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Abstract: The objective of the present investigation was to evaluate the concentrations of cortisol in peripheral circulation around parturition and weaning in camels (*Camelus dromedarius*). Ten pregnant Arabi camels, of a mean age of 8.5 years and at 12 months of pregnancy were kept into shaded areas throughout the experimental period (45 days). Sampling intervals were 1 week before parturition, parturition, 1, 3 and 5 days post parturition. No effect of sex on cortisol plasma level was observed. Cortisol level was 121.6 ± 5.4 at day of parturition and then decreased to 30.1 ± 1.9 and 21.9 ± 1.0 ng mL⁻¹ at day 3 and 5 post parturition, respectively. Cortisol serum level was 37.1 ± 1.4 ng mL⁻¹ one day before weaning and then increased to 48.0 ± 1.5 and 69.5 ± 1.9 ng mL⁻¹ at weaning and 3rd day after weaning, respectively. The study revealed that following weaning and around parturition, cortisol status increased, which is regarded as an adaptive measure to harsh desert conditions.

Key words: Camel, cortisol, parturition, weaning

INTRODUCTION

Camels thrive in arid and semiarid areas, although food and water frequently are scarce by the aid of different physiological and biochemical adaptive strategies^[1]. Animals are exposed to wide array of physiological (weaning; vaccination, etc.) and pathological (diseases) stressors. Biomarkers of these conditions include assessment of both individual and Total Antioxidant Capacity (TAC) as well as lipid peroxidation. In this regard, cortisol, a hormone secreted by the adrenal glands is the hormone, which is regarded as an indicator of stress in cattle^[2]; wildlife^[3]; pigs^[4] and alpacas^[5]. Cortisol plasma levels were higher after transportation^[5]; hypoxemia in New-World Camelids (NWCs)^[6], but not affected by food deprivation in the dromedary^[1]. There are no reports describing cortisol status in dromedary at time of birth and weaning. Therefore, the purposes of the current study reported here were to determine cortisol plasma levels in relation to parturition and weaning.

MATERIALS AND METHODS

Animals and feeding: Ten Arabi pregnant camels (*Camelus dromedarius*), of mean age 8.5 years and at 10th month of pregnancy were brought from the field area and kept indoor throughout the experimental period (45 days). Camels were fed solely on *Acacia mellifera* (different parts) collected from the field. Calves at parturition were kept with their dams and calves were sampled prior colostrums intake. Each young camel was abruptly separated from its mother after 30 days of

nursing (or at 1 month of age). The weaned calves were fed milk substitutes prepared commercially for lamb.

Samples collection: Blood samples were collected from the jugular vein into vacutainers tubes preparturition and 3 and 5 days post parturition and pre weaning and at day 3 and 5 post weaning. Cortisol was measured by ELISA method as described by Munro and Lasley^[7]. Briefly, 50 µL of serum was mixed with 1 ml of ethyl alcohol and this stimulated protein precipitation. The supernatant was transferred to another tube and then dried out by air current. The sample was reconstituted with ELISA assay buffer and 10 µL was used for the determination of cortisol. The intra and inter-assay of coefficients of variations were 5 and 7%, respectively.

Statistical analysis: Analysis of variance (ANOVA), general linear model was used to assess the effect of sex and day of blood sampling on cortisol serum levels. Duncan Multiple Range Test (DMRT) was used for means comparison. Data are presented as means \pm SE and significance was detected at $p < 0.05$.

RESULTS AND DISCUSSIONS

Camels are animals exposed to a wide array of physiological and pathological stressors in harsh grazing condition. However, they acquire various biochemical adaptive patterns to produce and reproduce. This investigation describes the cortisol levels in Sudanese camels in relation to parturition and weaning. The study indicated no effect of sex on cortisol serum levels in camel. At parturition day, cortisol was 121.6 ± 5.4 ng mL⁻¹

Table 1: Serum cortisol concentrations (ng mL⁻¹) around parturition camel (*Camelus dromedarius*)

Sex	Parturition	3rd day	5th day
Male	121.6±5.4 ^a	30.1±1.9 ^b	21.9±1.8 ^c
Female	119.9±4.9 ^a	31.05±2.3 ^b	20.9±1.3 ^c

Values are presented as means±SE ^{a,b,c} Means on the same raw having different superscripts are significantly different at p 0.05

Table 2: Serum cortisol concentrations (ng mL⁻¹) in camel (*Camelus dromedarius*) around weaning

Sex	Weaning	3rd day	5th day
Male	48.1±1.4 ^a	69.5±1.5 ^b	33.6±1.7 ^c
Female	46.0±2.0 ^a	67.9±1.2 ^b	32.4±1.3 ^c

Values are presented as means ±SE ^{a,b,c} Means on the same raw having different superscripts are significantly different at p 0.05

followed by a reduction to 30.1±1.9 ng mL⁻¹ at 3rd day and 21.9±1.0 ng mL⁻¹ at 5th day (Table 1). On the other hand, day one pre-weaning the cortisol level was 37.1±1.4 ng mL⁻¹, followed by increase at day 3 to 69.5±1.9 ng mL⁻¹ and day 5 to 33.6±1.7 ng mL⁻¹ returned to basal level (Table 2).

Dehydration increased cortisol concentrations significantly in both the seasons but the increase was much higher during summer^[8]. Anderson *et al.*,^[5] indicated a 30% increase in plasma cortisol 30 minutes post transport of alpaca (from 1.4 to 2 µg dl. However, repeated venipuncture did not appear to cause an anxiety response based on serum cortisol^[9].

Cortisol can be used as indicators to predict the time of parturition in camels^[10]. Late pregnant sheep showed an increase fetal plasma cortisol concentration output, which contributes to fetal organ maturation as well as to the onset of parturition^[11]. Males showed reduction cortisol concentrations during the non-breeding season^[12], with diurnal rhythm^[13].

Cortisol increased from 6-11 ng mL⁻¹ during exercise to maximum of 25 ng mL⁻¹. The levels returned to normal after 2 to 4 h of rest^[14]. Plasma cortisol concentration in llama ranged 2.6-51.9 ng mL⁻¹ from mating until 2 wk before parturition^[15]. The present study indicated a sudden increase in maternal serum cortisol level following parturition. Similar trends were observed in dromedaries by Elias and Weil^[16], Bactrian camels^[17] in llama and alpacas^[15,18] and in bitch^[19]. Calving difficulties and stillbirth changed the patterns of cortisol^[20].

During weaning, camels showed elevated levels of cortisol, which are maintained until day 3 after weaning, decreases to basal level by day 5. The present study indicated no difference in cortisol serum level in both prenatal and weaning periods between male and female camel's calves. These findings are in agreement with those obtained in llamas^[21]. It is suggested that high cortisol status in newly born camel's calves could be regarded as an adaptive measure for harsh condition prevalent in the desert area.

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