

TESTOSTERONE AND GROWTH HORMONE LEVELS IN FEMALE DROMEDARY CAMELS

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ABSTRACT

This study was designed to establish the normal level of testosterone and growth hormone (GH) in female camels (*Camelus dromedarius*) starting at 6 months until 10 years of age. Two groups each of 55 clinically healthy female camels were used in this study. The first group was aged from 6 till 15 months while the second group was aged over 15 months until 10 years of age. Both camel testosterone and GH were analysed using double-antibody sandwich enzyme-linked immunosorbent one-step processes. For testosterone, the detectable assay range was 0-320 pg/mL and the minimum detected level was typically less than 1.0 pg/mL. For GH, the detectable assay range was 0-16 ng/mL and the minimum detected level was typically less than 0.1 ng/mL. Compared to a value of 51±9 pg/mL in camels aged 6 to 15 months, the testosterone value was 52±7 pg/mL in camels aged over 15 month until 10 years of age. The minimum and maximum levels in the first group were 34 pg/mL and 75 pg/mL, while the minimum and maximum levels in the second group were 37 pg/mL and 66 pg/mL, respectively. There was no statistically significant difference when compared testosterone values in both groups. Compared to a value of 2.7±0.4 ng/mL in camels aged 6 to 15 months, the GH value was 2.2±0.3 ng/mL in camels aged over 15 month until 10 years of age. The minimum and maximum levels in the first group were 1.9 ng/mL and 4.3 ng/mL, while the minimum and maximum levels in the second group were 1.6 ng/mL and 2.9 ng/mL, respectively. There was a highly statistically significant difference when compared GH values in both groups.

Key words: Beauty pageants, camel, dromedary, growth hormone, testosterone

In order to enhance the growth and performance, many camel owners use growth and testosterone hormone in the young camels participating in King Abdulaziz Camel Festival (KACF) at Saudi Arabia. Medical committee of KACF Examines levels of these hormones and elevated levels disqualify the camel and it is a punishable offence (Tharwat and Al-Hawas, 2021).

Growth hormone (GH) is an important polypeptide of vertebrates commercially important in the areas of veterinary medicine, animal husbandry and animal production (DeNoto *et al*, 1981; Ayson *et al*, 2000). Biotechnology is used to enhance milk and meat production through Lactating animals' growth hormones and growth development of the animal are also controlled. GH also regulates complex physiological processes such as metabolism, reproduction and cell proliferation (Devlin *et al*, 1994).

Three key hormones are considered the "anabolic giants" in cellular growth and repair: testosterone, the growth hormone superfamily, and

the insulin-like growth factor (IGF) superfamily (Kraemer *et al*, 2020).

Doping control in Horse racing and animal-related events poses different challenges, in comparison with other sports where humans are involved, because both performance-enhancing and performance impairing substances (or methods) can be used to manipulate and change the outcome of the competition while the controls are not standardised and rarely applied (Wong and Wan, 2014).

The androgenic-anabolic steroids (AAS) are synthetic derivatives of the male hormone testosterone. Testosterone is a precursor of other steroid hormones. The major functions of testosterone are pubertal development for spermatogenesis, regulation of the differentiation of the prostate, stimulation of erythropoietin production in the kidney and stem cells of the haematopoietic system, and the acceleration of growth during puberty in conjunction with growth hormone (GH) (Jeong *et al*, 2010). The GH belongs to a family of

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somatolactogenic hormones that have classically included prolactin and placental lactogen and more recently have been expanded to include a number of the hematopoietic growth factors. The synthesis and secretion of GH are stimulated by GH-releasing hormone, a hypothalamic peptide hormone (Burton *et al*, 1994). The aim of the present study was therefore to evaluate the normal level of testosterone and GH in female camels (*Camelus dromedarius*) starting at 6 months until 10 years of age during competition in camel beauty pageants at KACF, Saudi Arabia.

Materials and Methods

The study area was KACF, Saudi Arabia and apparently healthy camels were included in the present investigation. These camels were aged between 10 months to 10 years and divided into two groups.

The first group had camels from 6 till 15 months of age while the second group had camels over 15 months until 10 years of age. Enrollment in the study was based on normal complete physical examination findings, normal cardiac auscultation, normal complete blood cell counts, and normal biochemistry profiles. Blood samples (7 mL) were collected in plain vacutainer tubes and sera were harvested.

Testosterone and growth hormones assays

Both testosterone and GH were analysed using double-antibody sandwich enzyme-linked immunosorbent one-step processes (Camel testosterone and Camel GH ELISA kits, CAT., NO: CKCA-0011 & CKCA-0013; LOT#: P20201127, Melsin Medical Co., Limited, China). For testosterone, the detectable assay range was 0-320 pg/mL and the minimum detected level of testosterone was typically less than 1.0 pg/mL. For GH, the detectable assay range was 0-16 ng/mL and the minimum detected level of GH was typically less than 0.1 ng/mL. Both assays had high sensitivity and excellent specificity for detection of camel testosterone and GH with intra-assay CV (%) < 10% and inter-assay CV (%) < 15%. The assays recognised recombinant and natural testosterone and GH and no significant cross-reactivity or interference between testosterone and GH and analogues was observed.

Statistical analysis

Data normality was examined using the Kolmogorov-Smirnov test. The data were presented as means ± SD and were analysed statistically using the SPSS statistical package (2009). A Student's t-test

was used for comparisons testosterone and GH in both groups. Significance was set at $P \leq 0.05$.

Results

Table 1 summarises testosterone and GH levels mean ± SD) in camels, minimum and maximum values, alongside the 25th, 50th, 75th, 95th and 99th percentiles. Compared to a value of 51±9 pg/mL in camels aged 6 to 15 months, the testosterone value was 52±7 pg/mL in camels aged over 15 month until 10 years of age. The minimum and maximum levels in the first group were 34 pg/mL and 75 pg/mL, while the minimum and maximum levels in the second group were 37 pg/mL and 66 pg/mL, respectively. There was no statistically significant difference when compared testosterone values in both groups ($P=0.19$). Compared to a value of 2.7±0.4 ng/mL in camels aged 6 to 15 months, the GH value was 2.2±0.3 ng/mL in camels aged over 15 month until 10 years of age. The minimum and maximum levels in the first group were 1.9 ng/mL and 4.3 ng/mL, while the minimum and maximum levels in the second group were 1.6 ng/mL and 2.9 ng/mL, respectively. There was a highly statistically significant difference when compared GH values in both groups ($P<0.0001$).

Table 1. Testosterone and growth hormones levels in camels aged 6-15 months and in those over 15 months up to 10 years (n=55).

Parameter	Testosterone (pg/mL)		Growth hormone (ng/mL)	
	06-15m	15m-10y	06-15 month	15m-10y
Mean ± SD	51±9 ^a	52±7 ^a	2.7±0.4 ^a	2.2±0.3 ^b
Minimum	34	37	1.9	1.6
Maximum	75	66	4.3	2.9
0.25% Percentile	45	46	2.4	2.0
0.50% Percentile	50	51	2.7	2.2
0.75% Percentile	55	57	2.9	2.3
0.95% Percentile	65	62	3.4	2.6
0.99% Percentile	71	64	3.9	2.9

Discussion

Camel beauty pageants are being held regularly in Saudi Arabia since last 5 years where tremendous prizes are awarded. Plastic surgery in camels is currently rampant in the Gulf region (Tharwat and Al-Hawas, 2021).

Injection of hormone such as testosterone and GH in widely used for enabling participating camels to have enhanced performance, stamina and looks (Tharwat and Al-Hawas, 2021). For investigation

of the last point, this study was carried out. To the best of the authors' knowledge, this is the first study measuring testosterone and GH values in female camels from 6 months until 10 years of age.

For many years, Androgenic Anabolic Steroid use (AAS) have been popular among athletes both for performance improvement and for aesthetic reasons. The first documented reports of misuse of AAS by athletes stem from the 1950s. Since the first results were less motivating, he concluded that androgens might exert particular psychological effects (Hartgens and Kuipers, 2004). However, since several AAS-using athletes won competitions and championships in that period, the abuse of these agents in sport began to spread (Celotti and Cesi, 1992; Yesalis *et al*, 2000).

Recently, it has become apparent that AAS may exert strong effects on psyche and behaviour (Medras *et al*, 2018). The potential for anabolic steroid abuse in equine sports has increased in recent years due to the growing availability of designer steroids (Waller and McLeod, 2017). Administration of recombinant ontogeny endocrine (rCGH) in animals is a useful approach to manipulate endocrine system and metabolic pathways towards faster growth rate, muscle deposition, milk yield and better feed efficiency (Khan *et al*, 2016).

Shah and Ashraf (2018) reported that liquid chromatography mass spectrometry (LC-MS) to detect four common doping drugs, i.e. cortisol, dexamethasone, methylprednisolone, and flumethasone in camel hair samples.

The GH is a substance produced by the body in order to help stimulate the production of new tissue. In younger animals, the hormone will be present in much higher levels as the animals are growing to their optimum adult size. The results of this study agree well with this scientific fact where the level of GH was significantly higher in female camels less than 15 months compared to second group up to 10 years of age. Once they reach adulthood, the levels of GH within their body will substantially decrease but will maintain a constant background level in order to help with functions such as recovery from injury and building extra muscle. Clinical and preclinical studies have suggested that anabolic hormones, such as GH, insulin-like growth factor I (IGF-I), and IGF binding protein 3, may reverse the catabolic state associated with cachexia in patients (Colao *et al*, 1999; Kotler, 2000; Wang *et al*, 2000). In conclusion, the testosterone and GH levels recorded in this study can be used as

reference values when evaluating these hormone levels in camel beauty pageants.

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