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Source: Journal of Wildlife Diseases, 30(3) : 426-428

Published By: Wildlife Disease Association

URL: https://doi.org/10.7589/0090-3558-30.3.426

Journal of Wildlife Diseases, 30(3), 1994, pp. 426–428

Serum Chemistry Values for Arabian Sand Gazelles (*Gazella subgutturosa marica*)

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ABSTRACT: Values for urea, creatinine, glucose, total bilirubin, sodium, potassium, chloride, calcium, phosphates, magnesium, alkaline phosphatase, aspartate aminotransferase, alanine aminotransferase, lactate deshydrogenase, and creatine-kinase are reported for the first time for 32 sand gazelles (*Gazella subgutturosa marica*) in Saudi Arabia. Comparisons were made between two groups: one sampled before a trip and the other sampled after a 14 hr trip. Only aspartate aminotransferase was higher in the second group; magnesium and phosphates were lower in that group.

Key words: Sand gazelles, serum characteristics, Antilopinae, *Gazella subgutturosa*.

Three species of gazelles are considered native to Saudi Arabia (Thouless et al., 1991): the goitred gazelle or sand gazelle, *Gazella subgutturosa*, known locally as rheem; the Arabian gazelle *G. gazella*; and the Saudi gazelle, *G. (Dorcas) saudiya*. The rheem found in Saudi Arabia is thought to be a subspecies (*G. subgutturosa marica*), different from the one found in Persia (*G. subgutturosa subgutturosa*) (Harrison and Bates, 1991). The only two areas in Saudi Arabia where the sand gazelles still are resident are the Al Harrah and Al Khunfah reserves in the north. However, two captive populations also exist: Thumamah, managed by the King Khaled Wildlife Research Center (KKWRC) (25°03′N, 46°45′E) near Riyadh, and another at Gassim (27°09′N, 43°29′E).

As with other wild animals, sand gazelles manifest few clinical signs of disease. Baseline biochemical data are needed to determine the physiological effects of wildlife diseases. Little information is available for gazelle species generally (Bush et al., 1981) and none for the sand gazelle.

On 10 June 1991, 32 adult animals (eight females, 24 males) had their blood sampled for biochemical analyses. The animals all were captured by use of a boma (trap made with canvas around a food point and released by a remote control system) (Pienaar, 1973) in the private collection of Gassim; they then were caught manually inside the trap. The animals' heads were covered immediately on capture, and no undue stress was noted during handling. For ten animals (group 1), blood samples were immediately collected from the jugular vein, the elapsed time between manual capture and sampling was 5 to 15 min. Samples were placed in an insulated container with ice-packs. Within 2 hr, each clot was separated by centrifugation; sera were stored in liquid nitrogen. The 22 other animals (group 2) were individually crated immediately after the capture and loaded on a truck. No tranquilizers or drugs were administered. The animals were transported during the night to avoid heat stress. The transport lasted 14 hr before reaching the protected area, Mahazat as Said (about 200 km east of Taif, 21°59′ to 22°31′N, 40°27′ to 42°12′E) where the animals were destined to be reintroduced. No stress was observed in the gazelles during transportation.

The animals were sampled at their arrival in Mahazat as Said following the same protocol; the gazelles were manually restrained and their heads were covered, the elapsed time between capture in the crate and blood sampling was about 10 min. Sera were separated within 4 hr. All sera were stored at −80 C until laboratory analyses were conducted as a retrospective study 16 mo later. Following sampling all animals were carefully watched during the next few weeks as part of a behavioral ecology study. No gazelle showed any signs of illness. We assumed that all gazelles were in good health. Urea nitrogen, creatinine,

TABLE 1. Blood chemistry values for sand gazelles, Saudi Arabia, June 1991.

		All gazelles (n = 32)	Group 1 (n = 10)	Group 2 (n = 22)
Urea	mmol/l	9.2 ± 1.3[a]	9.63 ± 3.9	9.08 ± 0.8
Creatinine	μmol/l	114 ± 15	122.9 ± 4	111.32 ± 11.5
Glucose	mmol/l	6.3 ± 0.7	5.23 ± 1.4	6.8 ± 0.8
Total bilirubin	μmol/l	11 ± 2	11.1 ± 3.7	12.23 ± 3.5
Sodium	mmol/l	170 ± 8	175.6 ± 20.6	167.32 ± 8.2
Potassium	mmol/l	5.7 ± 0.3	6.28 ± 0.8	5.52 ± 0.2
Chloride	mmol/l	128 ± 7	133.5 ± 16.9	126.64 ± 6.8
Calcium	mmol/l	2.58 ± 0.14	2.51 ± 0.3	2.62 ± 0.2
Phosphates[b]	mmol/l	1.71 ± 0.40	2.37 ± 0.7	1.42 ± 0.4
Magnesium[b]	mmol/l	0.68 ± 0.08	0.84 ± 0.2	0.62 ± 0.1
ALP[c]	U/l	15 ± 5	14.4 ± 2.5	15.68 ± 7.4
AST[b,c]	U/l	202 ± 28	148.2 ± 56	227.09 ± 27.9
ALT[c]	U/l	22 ± 4	20 ± 5.2	24.05 ± 5.9
LDH[c]	U/l	141 ± 52	109.6 ± 15	156.1 ± 76.3
CK[c]	U/l	20[d]	20	20

[a] Mean ± 95% confidence limits.
[b] Significantly ($P < 0.05$) different between Group 1 and Group 2.
[c] ALP: alkaline phosphatase, AST: aspartate aminotransferase, ALT: alanine aminotransferase, LDH: lactate dehydrogenase, CK: creatine-kinase.
[d] No confidence limits because value was identical for each animal.

glucose, total bilirubin, sodium, potassium, chlorides, calcium, phosphates, magnesium, alkaline phosphatase (ALP), aspartate aminotransferase (AST), alanine aminotransferase (ALT), lactate dehydrogenase (LDH), and creatine-kinase (CK) concentrations were determined with an Ektachrome 700 KODAK system (Kodak Clinical Diagnostics Europe, Lingolsheim, France) with dry-chemistry reagents according to the manufacturer's recommended procedures. Variances in the two groups were compared and results from the two groups (sampled before or after the 14 hr trip) were compared using a Mann-Whitney test (Systat for Windows, 1992). From the pooled sample, we calculated the mean ($\bar{x}$), standard deviation (SD), and mean 95% confidence interval ($\bar{x} \pm 1.96\ \mathrm{SD}/\sqrt{n}$) for all characteristics.

Variances were greater ($P < 0.05$) for the 22 animals sampled post-shipment for ALP and LDH (Table 1). They were less in that group for urea, creatinine, potassium, and magnesium. Results between the two groups were significantly different for AST ($P < 0.001$), magnesium ($P < 0.05$) and phosphates ($P < 0.01$). Phosphate and magnesium concentrations were lower for the animals sampled post-shipment, but AST was higher.

Calcium and phosphorus values of our gazelles were similar to values reported for *G. dorcas*, *G. granti* and *G. thomsoni* (Bush et al., 1981). The mean value for glucose (1.136 g/l) was more similar to that reported for *G. dorcas* (1.26 g/l) than for *G. granti* (1.83 g/l); however, glucose concentrations are sensitive to sample handling artifacts. For example, delay in centrifugation could reduce the glucose levels and increase the potassium.

The mean values for urea nitrogen (0.56 g/l) and total bilirubin (0.69 mg/dl) in sand gazelles were more than twice those found for *G. dorcas* and *G. granti* (0.22 and 0.21 g/l for urea nitrogen and 0.22 and 0.32 mg/dl for total bilirubin, respectively). Mean ALP activity (15.28 U/l) was very low compared with values for *G. dorcas* (327 U/l) or *G. granti* (235 U/l) (Bush et al., 1981). Mean LDH (141 U/l) was similar to that in *G. granti* (184 U/l) but markedly different from LDH reported

for *G. dorcas* (763 U/l). Mean AST (202 U/l) in our gazelles was similar to that in *G. dorcas* (203 U/l), but was greater than in *G. granti* (79 U/l). Sodium, chloride and potassium values in Sand gazelles appeared similar to values measured in *G. dorcas* and *G. granti*.

Many of the differences may be attributed to differences in measuring techniques, to varying animal health status, or to the degree of dehydration. Normal species variation also may account for many of the between-study differences noted. Even within animal (from bleeding to bleeding) the variance was much greater than the variances from animal to animal (Bush et al., 1981).

The increase of AST and the decrease of magnesium after shipment could be due to a slight myopathy as described by Vassart et al. (1992), but creatine kinase remained the same. The identical and low value found for all the animals for creatine kinase means that the level is below the threshold of detection. This could be an artifact due to alteration during the long frozen storage.

This work was conducted under the patronage of HRH Prince Saud Al Faisal and Dr. Abuzinada, Secretary of the National Commission for Wildlife Conservation and Development of the Kingdom of Saudi Arabia. We thank Drs. Williamson and Rietkerk for allowing us to sample the sand gazelles from Qassim and Didier Concordet.

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Received for publication 9 July 1993.