

Water deprivation effects on the hematological and hematochemical pictures of *Camelus dromedarius*

par MAHAMUD HAGI MOHAMED (1), ABDULHAMID HAGI MOHAMED (1),
A. LOCATELLI (2)

(1) Università Nazionale Somala di Mogadiscio, Facoltà di Medicina Veterinaria e Zootecnia, Dipartimento di Patologia.
(2) Università degli Studi di Milano, Istituto di Patologia generale Veterinaria, Via Celoria, n° 10, 20133 Milano, Italia.

RÉSUMÉ

MAHAMUD HAGI MOHAMED, ABDULHAMID HAGI MOHAMED, LOCATELLI (A.). — Effets de la privation hydrique prolongée sur des paramètres hématologiques et hématochimiques du dromadaire. *Rev. Elev. Méd. vét. Pays trop.*, 1984, 37 (3) : 313-317.

Les auteurs ont étudié les effets de la privation d'eau (25 jours) sur trois dromadaires (une femelle et deux mâles), alimentés avec du foin, près de Mogadiscio (Somalie) de mars à mai 1983.

La privation d'eau cause un faible amaigrissement ; parmi les paramètres hématologiques et hématochimiques examinés, seuls l'hématocrite, le cholestérol, CPK, le Na et le Cu ont montré des modifications significatives.

Mots clés : Privation d'eau - Hématologie - Dromadaire - Somalie.

SUMMARY

MAHAMUD HAGI MOHAMED, ABDULHAMID HAGI MOHAMED, LOCATELLI (A.). — Water deprivation effects on the hematological and hematochemical pictures of *Camelus dromedarius*. *Rev. Elev. Méd. vét. Pays trop.*, 1984, 37 (3) : 313-317.

The effects of prolonged water deprivation (25 days) in three adult dromedaries (one female and two males) fed on hay have been studied in Mogadiscio area Somalia.

After dehydration period a moderate thinning was noticed ; the hematological and hematochemical pictures were little affected : the only PCV, cholesterol, CPK, Na and Cu values showed significant changes.

Key words : Water deprivation - Hematology - Dromedary - Somalia.

INTRODUCTION

As the ability of the camel to withstand water deprivation for prolonged periods of time is legendary, quite recent are the knowledges about some physiological characteristics that give camel this capacity.

That would be due to : 1) the distribution, turnover and renal excretion of water and electrolytes (2, 7, 8, 10) ; 2) the decrease of metabolic rate with increasing dehydration (6) ; 3) the erythrocyte resistance to strong osmotic differences (3, 12) ; 4) a peculiar temperature regulation (6, 7) ; 5) local fat storage in the hump (8). These physiological characteristics enable the camel to survive

more than 15 days without water, in the sun, at 41 °C, while the Merino sheep dies in 6 days and the man in 1-2 days.

This study was undertaken to examine whether water deprivation for a 25 days period has any effects on the hematological and hematochemical pictures of the camel.

MATERIALS AND METHODS

Three adult one humped camels (*C. dromedarius*), one female (n° 1) and two males (nos 2-3) were kept in a little open yard, with shade available and were fed on hay once a day. The female was larger than males.

This work was carried out in Mogadiscio

area (Somalia) during March-May months 1983.

Blood samples were collected, from jugular vein, 12 hours after a period of *ad libitum* drinking of water and then at 7-14-21-25 days from water deprivation.

For each withdrawal, blood was collected :

1) in a heparinized tube, for erythrocyte and leukocyte counts and for PCV determination (3 500 r.p.m./15 mn) ;

2) in a tube without anticoagulant to obtaining the serum, after clotting at room temperature and centrifugation at 3 500 r.p.m./15 mn ;

3) directly from the needle on a slide for a leukocyte differential count (May Grünwald-Giemsa stain).

The serum was immediately kept at -20°C until the quantitative determinations of the following organic and inorganic constituents : CPK, AST, GGT, glucose, total protein, urea nitrogen, triglycerides, total and free cholesterol, Ca and inorganic phosphate (assayed by bichromatic Analyzer ABA 200) ; NEFA (by Biochemia colorimetric method) ; Na, K, Cu, Zn, Mg (by atomic absorption Spectroscopy Perkin Elmer 5000).

The data recorded were subjected to two way analysis of variance.

RESULTS

The results of experiment (see tables n^{os} I-II-III) show that :

TABLE N° I - Hematological values

	Camel N°	Days of water deprivation					Statistical analysis
		0	7	14	21	25	
Erythrocyte ($\times 10^6/\text{mm}^3$)	1	5,000	5,000	5,300	6,300	6,300	n.s.
	2	6,500	6,200	6,400	6,300	6,450	
	3	5,900	6,000	6,200	6,200	6,000	
Leukocyte ($\times 10^3/\text{mm}^3$)	1	31.0	33.0	30.0	30.0	27.0	n.s.
	2	10.0	9.4	8.6	9.9	9.0	
	3	7.0	7.4	6.9	7.0	9.0	
P.C.V. (p.100)	1	25	25	21	24	24	n.s.
	2	24	20	24	24	24	
	3	24	21	24	25	25	
Differential leukocyte count							
	Neutrophils(p.100)	1	16	20	21	14	29
		2	44	48	46	43	45
3		45	44	45	45	46	
Lymphocytes (p.100)	1	78	74	75	80	68	
	2	48	45	46	50	46	
	3	44	46	42	44	43	
Monocytes (p.100)	1	1	3	1	2	1	
	2	3	2	2	1	2	
	3	2	1	3	2	1	
Eosinophils (p.100)	1	5	3	3	4	7	
	2	5	2	6	6	7	
	3	9	9	10	9	10	
Basophils (p.100)	1	0	0	0	0	1	
	2	0	2	0	0	0	
	3	0	0	0	0	0	

n.s. : $P > 0.05$

TABLE N° 2 - Hematochemical values

	Camel N°	Days of water deprivation					Statistical analysis
		0	7	14	21	25	
C P K (UI/l)	1	165.8	45.0	53.7	58.5	80.9	**
	2	226.6	107.9	102.7	57.5	104.5	
	3	103.5	62.7	46.8	67.9	58.7	
A S T (UI/l)	1	70.7	56.0	54.0	54.4	57.4	n.s.
	2	73.6	78.7	83.9	63.9	70.1	
	3	64.2	63.4	60.0	75.0	65.2	
G G T (UI/l)	1	9.3	9.3	9.9	8.1	7.7	n.s.
	2	7.9	7.7	7.9	8.1	8.4	
	3	7.9	8.6	7.9	8.6	9.5	
Glucose (mg/dl)	1	110.3	108.2	103.8	96.6	123.4	n.s.
	2	101.6	89.0	99.8	112.6	108.5	
	3	95.7	98.6	104.2	109.9	101.5	
Urea nitrogen (mg/dl)	1	16.4	17.8	14.9	16.9	20.8	n.s.
	2	19.1	15.1	15.3	13.8	21.2	
	3	20.1	14.0	10.8	17.6	18.5	
Total protein (g/dl)	1	8.3	8.5	8.2	7.9	7.9	n.s.
	2	6.0	5.9	6.0	6.3	6.3	
	3	5.8	5.8	6.1	6.3	6.5	
Triglycerides (mg/dl)	1	37.46	81.07	65.11	53.20	107.20	n.s.
	2	28.94	35.00	35.60	59.30	38.57	
	3	43.65	53.84	90.74	34.92	90.53	
N E F A (mg/l)	1	26.71	99.72	42.74	35.61	81.91	n.s.
	2	227.94	67.67	85.48	128.21	106.84	
	3	124.65	67.67	49.86	113.97	138.90	
Total cholesterol (mg/dl)	1	24.84	50.48	64.20	65.34	66.21	*
	2	34.85	45.57	51.07	46.91	47.74	
	3	36.65	51.76	54.01	49.75	45.25	
Free cholesterol (mg/dl)	1	9.14	17.06	20.75	20.10	23.11	**
	2	10.82	15.16	16.11	15.06	15.49	
	3	10.91	16.60	18.04	15.98	16.34	

n.s. : $P > 0.05$; * : $P < 0.05$; ** : $P < 0.01$; *** $P < 0.001$.

1) the values obtained before dehydration period are similar to those reported by other authors (1, 2, 3) ;

2) among the hematological parameters considered, only PCV shows a transient, moderate, statistically significant decrease respectively on 7° (nos 2-3) and 12° day (n° 1) after water deprivation ; then the PCV values return to normal level ;

3) the values of most hematochemical para-

meters show wide fluctuations among animals and among withdrawals, but they are not statistically significant and probably are not correlated to the experimental conditions ;

4) total and free cholesterol values increase significantly on 7° day and remain at these levels until the end of dehydration period ;

5) the CPK values decrease significantly on 7° day and then remain at same levels ;

6) the Na serum levels rise significantly in

TABLE N° 3 - Mineral serum concentration

	Camel N°	Days of water deprivation					Statistical analysis
		0	7	14	21	25	
Na (mg/dl)	1	385.5	397.2	420.0	375.0	395.0	n.s.
	2	360.0	390.0	380.0	375.0	395.0	
	3	373.0	395.0	395.0	380.0	394.0	
K (mg/dl)	1	17.4	18.0	17.8	19.0	17.0	n.s.
	2	17.6	19.2	17.7	18.5	18.0	
	3	18.6	20.4	18.2	16.7	19.0	
Ca (mg/dl)	1	9.5	10.1	10.1	9.9	9.6	n.s.
	2	9.3	9.2	9.3	10.0	9.8	
	3	9.8	9.8	9.8	9.8	10.1	
P (mg/dl)	1	6.3	5.7	5.2	5.6	6.1	n.s.
	2	5.2	5.4	5.3	7.6	5.8	
	3	6.3	7.1	6.6	6.4	7.1	
Mg (mg/dl)	1	1.90	2.15	2.05	2.15	1.53	n.s.
	2	2.30	2.18	2.02	2.55	2.20	
	3	2.20	2.55	2.30	2.20	2.45	
Cu (µg/dl)	1	15.0	19.0	20.0	26.0	23.0	*
	2	78.0	80.0	83.0	93.0	85.0	
	3	80.0	87.0	90.0	86.0	95.0	
Zn (µg/dl)	1	64.0	80.0	75.0	82.0	78.0	n.s.
	2	50.0	45.0	60.0	63.0	52.0	
	3	60.0	55.0	57.0	65.0	62.0	

n.s. : $P > 0.05$; * : $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

the course of dehydration and the maximum levels are recorded on 7° (camels n°s 2-3) and on 12° day (camel n° 1) ;

7) also the Cu serum levels increase significantly during dehydration ; the values of the female are much lower than the ones of the males ;

8) at the end of dehydration period the camels exhibited a moderate thinning, but unfortunately we were not able to weigh them.

DISCUSSION

In spite of equatorial climate, the adult, healthy and resting camel, kept outside in a place to some extent shaded and fed on a dry diet, can tolerate easily a 25 days period of water deprivation : the only clinical sign is the thinning.

Most of the hematological and hematochemical constituents examined are not or little affected.

The transient decrease of PCV values in 7° (camel n° 1) or 12° day (camels n°s 2-3) after water deprivation agrees with data reported by YAGIL *et al.* These authors suggest the drop of PCV values is correlate to a shrinking in the size of erythrocytes due to a rise in medium tonicity. The greater Na concentration in blood after dehydration found by us and several other authors (9, 11) apparently confirms YAGIL view ; however our results indicate that the high Na levels persist during all the dehydration period, while the PCV values return quickly to the normal level.

We cannot confirm the data of YAGIL *et al.* (11) about the plasma Mg increase.

Quite surprising is the serum Cu increase, never recorded in literature up to now.

The early decrease of serum CPK values can be fully explained by the reduced possibility of walking about, while total and free cholesterol increase could be correlated to decreased

metabolic rate, reported by SCHMID-NIELSEN *et al.* (6) in dehydrated camels. So our results confirm the opinion of SCHMID-

NIELSEN *et al.* (7) that camel on a dry diet should be able to abstain from drinking for about 30-40 days in the winter.

RESUMEN

MAHAMUD HAGI MOHAMED, ABDULHAMID HAGI MOHAMED, LOCATELLI (A.). — Efectos de la privación hídrica prolongada sobre los cuadros hematológico y hematológico del dromedario. *Rev. Elev. Méd. vét. Pays trop.*, 1984, 37 (3) : 313-317.

Se estudiaron los efectos de la privación de agua en tres dromedarios (una hembra y dos machos) alimentados con heno, en la zona de Mogadiscio (Somalia).

La privación de agua provoca una ligera disminución de peso ; entre los parámetros hematológicos y hematológicos examinados sólo el hematocrito, el colesterol, la CPK, el Na y el Cu presentan alteraciones significativas.

Palabras claves : Privación de agua - Hematología - Dromedario - Somalia.

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