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## Cellular and Biochemical Blood Profile in Camels Suffering from Dubduba Syndrome

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### Abstract:

In order to investigate the possible correlation between the cellular and biochemical blood profiles and possible cause of Dubduba syndrome (DS), blood samples were taken from 16 camels suffered from DS and from 20 random apparently healthy. Blood samples were examined for total erythrocyte count (RBCs), packed cell volume (PCV), hemoglobin (HB) and total leucocytes count (WBCs). Meanwhile, serum was analyzed for determination of total protein, albumin, globulin, vitamin B12, calcium (Ca), magnesium (Mg) and phosphorus (P).

The results revealed that camels suffered from DS showed significant increase in WBCs counts ( $P < 0.05$ ) and significant decrease in magnesium level ( $P < 0.01$ ) compared to the DS-free camels. However, no significant differences were observed in the other examined elements. It could be concluded that, so far, DS had no significant effects on blood cellular and chemical profile of camels.

**Key Words:** Dubduba syndrome, DS, Camel, nervous signs, blood profile.

### Introduction:

In the year 2007 there was an outbreak with neurological manifestations in camels in Dubduba "an area which is located north east of Saudi Arabia". The disease was manifested by signs of head tremors, paralysis of the lower lip, paralysis of the fore- and hind-legs and recumbency prior to death. The etiology and clinical pathology of the disease are not yet identified, thus, the disease was initially called "Dubduba syndrome" (DS) according to the area where such an outbreak was first reported. Since then, several investigations to study the nature of the disease including causes, pathogenesis, epidemiology and other factors which enhance existing and severity of the

disease are documented (Al-Hizab and Abdelsalam, 2007; Al-Dubaib *et al.*, 2008; Al-Ghamdi *et al.*, 2009; Al-Swailem *et al.*, 2009 & 2010).

Pathogenesis of the disease is not fully understood and the information on the syndrome are still scanty, and the blood profile picture in the disease is not clear. Consequently, the present study aimed to investigate the possible correlation between the cellular and biochemical blood profiles and possible cause of DS.

### **Materials and Methods:**

#### **Target animals:**

Twenty-five camel herds located in Dubduba area were investigated during the year 2007. Camels were reared in semi-arid lands. Food was given ad libitum as camels kept free in grazing pasture and water was provided in tank all the time. Barley and concentrates were given twice a day. Medical and other veterinary services were provided when necessary.

#### **Samples:**

Ten ml of blood were withdrawn by puncture of the jugular vein from all the 16 camels found to be suffering from DS and from 20 apparently healthy camels which were randomly selected from Dubduba area as controls. Each blood sample was divided into two equal portions; one portion was used to harvest serum by centrifugation at 5000 rpm for 10 minutes. Ethylene diamine tetraacetic acid (EDTA) was added to the other portion for cellular examination.

#### **Sample Analysis:**

The blood samples were examined for total erythrocyte count (RBCs), packed cell volume (PCV), hemoglobin (HB) and total leucocytes count (WBCs) using modified automatic cell counter (Coulter Counter Vet. Scan, AB Axis, Hungary). Values of mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH) and mean corpuscular hemoglobin concentration (MCHC) were recorded. Blood serum was analyzed to determine total protein, albumin, globulin, vitamin B12, calcium (Ca), magnesium (Mg) and phosphorus (P) using biochemical analyzer (Chemistry Analyzer Ellipse, Italy). Albumin/globulin ratio was also calculated.

### Statistical Analysis:

Data were analyzed by the General Linear Model (GLM) procedure (SAS, Institute, Inc, 2002). Means + standard errors (SE) were calculated and tested for significance using student t - test. All skewed data (percentages) were transformed to the corresponding arc sin analysis before processing the statistical analysis.

### Results:

Sixteen camels from twelve different herds in the area were found to express nervous manifestations (Al-Dubaib *et al.*, 2008; Al-Ghamdi *et al.*, 2009). (Figure 1). Nervous signs lasted for seven days then camels became recumbent for 2-3 days prior death.

Table 1 shows mean haemogram values of DS and DS-free camels. WBCs counts in DS camels ( $10.78 \times 10^3$ ) increased significantly ( $P < 0.05$ ) compared to DS-free camels ( $8.37 \times 10^3$ ). Table 2 demonstrates biochemical analysis of the tested parameters. Results revealed significant ( $P < 0.01$ ) higher values of Mg in DS-free camels ( $1.269 \pm 0.062$ ) compared to DS camels ( $1.041 \pm 0.049$ ). The other examined parameters remained within the normal average in both DS and DS-free camels ( $P > 0.05$ ).

Table (1)  
Mean $\pm$  SE of haemogram values of DS and DS-free camels.

Variable	DS-free camels	DS camels
WBC ( $\times 10^3/\mu\text{l}$ )	8.37 $\pm$ 0.99	10.78 $\pm$ 0.46*
RBC ( $\times 10^6/\mu\text{l}$ )	9.13 $\pm$ 0.45	8.72 $\pm$ 0.21
HGB (g/dl)	12.50 $\pm$ 0.60	12.06 $\pm$ 0.28
PCV (%)	41.12 $\pm$ 2.75	38.35 $\pm$ 1.27
MCV ( fI)	45.02 $\pm$ 0.49	45.11 $\pm$ 0.23
MCH (Pg)	13.68 $\pm$ 0.28	13.85 $\pm$ 0.13
MCHC (g/dl)	30.37 $\pm$ 0.33	30.71 $\pm$ 0.15
PLT ( $\times 10^3/\mu\text{l}$ )	253.67 $\pm$ 39.86	302.57 $\pm$ 18.45

\*  $P < 0.05$

Table (2)  
Mean± SE Biochemical values of DS and DS-free camels.

Variable	DS-free camels	DS camels
Calcium (mmol/L)	2.673±0.045	2.652±0.039
Magnesium (mmol/L)	1.269±0.062	1.041±0.049**
Phosphorus (mmol/L)	2.475±0.194	2.336±0.155
Total protein (g/L)	71.500±1.567	69.879±1.250
Albumin (g/L)	38.024±1.132	36.000±0.903
Globulin (g/L)	33.073±0.739	33.939±0.582
Albumin/globulin	1.146±0.033	1.072±0.026
Vitamin B <sub>12</sub> (mmol/L)	856.990±160.472	1117.19±128.440

\*\* P < 0.01



Figure1: a camel suffered from DS showed nervous signs, recumbency and lateral inclination of the head and neck.

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## Discussion and Conclusion:

Following reports on the emergence of a new neurological disease erupted in camels at Dubduba area located north-east of Saudi Arabia, several investigations were carried out to study the magnitude of the problem and to identify its etiological agent (Al-Ghamdi *et al.*, 2009, Al-Hizab and Abdelsalam 2007). Diseases that cause neurological signs in animals are many and are usually caused by a variety of agents including viruses, parasites, bacteria, neuro-toxic chemicals and plant poisons as well as genetic abnormalities and nutritional deficiencies (Aldubaib *et al.*, 2008). The clinical signs of DS appear to resemble those of certain bacterial or viral diseases (clostridial infections, listeriosis, encephalitis, etc.), heavy metal poisoning, hypomagnesemia or vitamin A deficiency.

Diagnostic value of cellular and biochemical blood profile in many infectious and non infectious diseases may shed some light on the diagnosis and possible pathogenesis of such diseases (Benjamin, 1978; Faye *et al.*, 2006). Whole blood, plasma, and serum have been used extensively as measures of nutritional and metabolic status of animals with different diseases (Young and Bermes 1999). Therefore, investigation on the blood cellular and chemical changes that might occur due to the syndrome was carried out.

Our results revealed significant increase in WBCs in DS camels compared to those in healthy ones. The elevation of the WBCs is an indication of an infection that support findings of Al-Hizab and Abdelsalam (2007) who reported the syndrome as non-suppurative encephalitis, and they attributed the cause to an unknown viral infection. In addition, Al-Ghamdi *et al.* (2009) attributed the non-purulent meningo-encephalitis reported in camels from the same area to viral infection based on the severity of the inflammatory reaction, composition of inflammatory cell infiltrates and evidence of purkinje cell neurophagia.

Because of the ambiguity of the syndrome, some other factors such as neuro-toxic chemicals and plant poisons or nutritional deficiencies cannot be ruled-out. For example, toxicity with sulphur has been incriminated as a causative agent for the development of neurological signs in camels (Al-Swailem *et al.*, 2009).

Early reports indicated that the exposure of animals to chemical substances such as methyl mercury can cause adverse effects on the nervous system and induce convulsion, fatigue, irritability, tremor and other behavioral changes and may cause degenerative diseases of the brain. (Hunter and Russell, 1954; Eto *et al.*, 2001; Eto *et al.*, 2002).

In the current study, the obtained results of biochemical analysis revealed a significant ( $P < 0.01$ ) decrease in the values of Mg in DS camels. Values of calcium, phosphorus, total protein, albumin, globulin and Vitamin B12 in both DS and DS-free camels remained within normal levels.

The decrease in the level of Mg in DS free camels is not surprising as this outcome agrees with the findings of Aldubaib *et al.* (2008). It is well known that deficiency of Mg causes weakness, muscle cramps, increased irritability of the nervous system with tremors and jerking. The exacerbation between possible viral infection and hypomagnesaemia in DS camels is unknown and further investigation is worthwhile.

Although it was known that there is a diagnostic value of cellular and biochemical blood profile in many infectious and non infectious diseases (Faye *et al.*, 2006) but from these results it could be concluded that so far DS had no significant effects on blood cellular and chemical profile of camels. Further studies are recommended on the syndrome to disclose the causes and pathological changes of the condition.

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## خصائص الدم الخلوية والحيوية في الإبل المصابة بمتلازمة الدبذبة

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### الملخص:

من أجل التحقق من احتمال وجود علاقة بين الخصائص الخلوية والكیمیائیة للدم وبين الأسباب المؤدیة إلى الإصابة بمتلازمة الدبذبة، فقد تم أخذ عینات دم من 16 جملاً ظهرت علیها أعراض المتلازمة وكذلك تم أخذ عینات دم من 20 جملاً من نفس المنطقة لم تظهر علیها الأعراض تم اختیارها عشوائیاً وتم فحص عینات الدم لكلا المجموعتین بحیث شمل الفحص المجموع الكلی لعدد كریات الدم الحمراء (RBCs) وحجم الخلیة المتراص (PCV) وخضاب الدم (Hb) ومجموع عدد كریات الدم البیضاء (WBCs). وفي الوقت نفسه تم تحلیل مصل الدم لتحديد كمية البروتین والألبومین الكلی والجلوبیولین وفیتامین (ب 12) والكالسیوم والمغنسیوم والفوسفور. وقد كشفت النتائج أن الإبل التي عانت من المرض قد أظهرت زیادة جوهریة فی عدد الكریات البیضاء ( $P < 0.05$ ) وانخفاضاً جوهریاً فی مستوى المغنسیوم فی الدم ( $P < 0.01$ ) مقارنة بالمجموعة التي لم تظهر علیها الأعراض بینما بقيت مستويات العناصر الخلوية والكیمیائیة الأخرى فی الحدود الطبیعیة. وعلى ضوء النتائج يمكننا أن نستنتج أن متلازمة الدبذبة لیس لها تأثير جوهري على صورة الدم الخلوية والحيوية الكیمیائیة فی الإبل.