

بعض الدراسات عن أسباب إصابة الجاموس والابقار بالبول  
الدم سوا بكتريا الدم الحمراء أو بهيموجلومين الدم

س . العمروسي ، س . م . حسن ، ط . العلاوي ، ع . عبد المطلب

تتم في هذا البحث دراسة أسباب إصابة بول الجاموس والابقار بالبول الدم سوا بكتريا  
الدم الحمراء أو الهيموجلومين على عدد ١٨٧ حالة مصابة في محافظة أسيوط .

وقد تبين من هذه الدراسة ان الاسباب التي قد تؤدي الى مثل هذه الاصابات هي  
كالآتي :-

- ١- نقص الفوسفور .
- ٢- الإصابة بطفيل الدم (البابيزيا) .
- ٣- التهابات المثانة .
- ٤- بعض اصابات الكلبي .

وقد لوحظ لهذه الاصابات وجود بعض التفسيرات في بعض مكونات الدم والسليم مثل  
الهيموجلومين ، كرات الدم الحمراء والبيضاء ، الفوسفور الغير عضوي ، الكلبي  
الصديق ، البوتاسيوم ، الكلوريد ، والنحاس .



Dept. of Medicine & Infectious Diseases.  
Faculty of Veterinary Medicine, Assiut University.  
Head: Prof. Dr. M. Nadim.

SOME STUDIES ON THE CAUSES OF HAEMATURIA AND  
HAEMOGLOBINURIA IN CATTLE AND BUFFALOES IN ASSIUT  
(With Six tables)

By

EL-AMROUSI, S.M. HASSAN, T. EL-ALLAWY, AND A. MOTTELIB

(Received at 21/7/1977)

SUMMARY

This work is designed to study the possible causes of haematuria and haemoglobinuria and also the changes that may occur in blood and serum of 187 cattle and buffaloes in Assiut province.

The recovered causes inducing such conditions are: hypophosphataemia, babesiosis, cystitis, and kidney affections.

In hypophosphataemia, there was a decrease in haemoglobin concentration, total erythrocyte number, haematocrit value and the inorganic phosphorus while total leucocyte number and calcium remained normal.

In babesiosis, the haemoglobin concentration, total erythrocyte number, haematocrit value, calcium, inorganic phosphorus, sodium were decreased while potassium level was increased. Chlorides and copper remained unchanged.

In cystitis, the obvious changes were a slight increase in the total leucocyte count. The inorganic constituents of serum were not affected except a slight decrease in sodium and slight increase in potassium.

In kidney affections; a- In acute nephritis, there was a slight increase in the total leucocyte count and potassium while the level of copper was slightly reduced.

In embolic nephritis, slight increase in the levels of chlorides and potassium, such increase was not significant.



## INTRODUCTION

Many diseases (Hypophosphataemia, babesiosis, renal diseases and urinary bladder affections) are accompanied by change in urine constituents. The abnormality includes in these cases the presence of either blood cells or haemoglobin.

Early reports in Egypt by AWAD and ABDEL LATIF (1963) described a syndrome of hypophosphataemia and accused this to Barseem feeding. Recently, HASSAN (1977) in his extensive study about such a syndrome gave more details in Upper Egypt and could classify the different causes inducing such abnormalities. The present investigation aimed to study the causes of such conditions in relation to the change that occur in blood cytology and some constituents of serum and blood.

## MATERIALS AND METHODS

Jugular blood samples from a total number of 187 cattle and buffaloes were used in this work. Blood smears were also mounted. Catheterized urine samples were also collected. Methods for collections were adopted after ROSENBERGER et al. (1964).

### Methods adopted:

The methods for haematological assay were adopted after that described by HASSAN (1977).

The inorganic phosphorus was estimated using the method of FISK and SUBBARAW (1925), chlorides according to SHALES and SHALES (1941), potassium and sodium by using EEL flame photometer (HAWK and OSER, 1955), calcium according to CLARK and COLLIP (1925). Serum copper was estimated by use of the test kites supplied by MERCK (Darmstadt, W. Germany), the method is based after the modification described by ZAK and RESSLER (1956).



## RESULTS AND DISCUSSION

According to the urine and blood findings (table 1 & 2) together with the clinical manifestations correlated with the changes in blood and serum constituents (table 3 ) the sick animals were classified according to the possible causes of haematuria and haemoglobinuria. The discussion will deal collectively with the results obtained from blood picture (table 4) and the changes of some of serum constituents (table 5 & 6).

**Hypophosphataemia:**

Blood appeared thin and watery with haemolysed serum in some cases. Packed cells decreased in volume and reached a value of 16-17.9%. Similar observations were reported By ALBRITTON (1955). CLEGG and EVANS (1962) and AWAD and ABD EL-LATIF (1963). The authors attributed these changes to the destruction of red blood cells with a resultant release of haemoglobin causing a decrease in haemoglobin concentration accompanied by eligothythemia.

In babesiosis, confirmed by blood smear examination, there was a marked decrease in haemoglobin to reach 8.2 gm% in cattle and 6.4 gm% in buffaloes. Packed cell volume behaved in a similar pattern as haemoglobin. It decreased to 24.5% and 16% in cattle and buffaloes respectively. The erythrocytic count is dramatically decreased (3.54 and 2.2 million per cu; m.m. in cattle and buffaloes).

Reports by MARTYLAN (1956), and BROCKLESSY et al.(1971) dealing with similar conditions attributed this again to the destructed red cells. The leucocytic count was slightly increased to 8.3 and 9.3 thousands per cu. m. m. in cattle and buffaloes. White cell picture was described previously by MARYIAN (1956) and COLES (1967) in cattle and by NEITZ(1938) and DORVER (1967)in buffaloes and all gave a rather similar picture.



In cystitis, the only obvious changes in that a slight increase in total leucocytic count probably resulting from bacterial infection.

Patients with kidney affection constituted 10 animals with nephritis, embolic nephritis and renal colculi (table 4). Urine findings with special reference to the microscopical examination of sediment emphasize these respective diseases. A marked increase in leucocytes was the only detectable change in this blood picture. One can notice clearly that this picture could be easily differentiated from those suffering from babesia infection or hypophosphataemia affected individuals. It resembles those with cystitis.

The constituents of blood serum showed wide variations in these diseases. The inorganic phosphorus occupied serious changes in cases of hypophosphataemia where the phosphorus levels dropped to reach  $1.18 \pm 0.56$  mg% and  $1.26 \pm 0.4$  mg% in cattle and buffaloes respectively. The decrease in phosphorus was previously reported by ALBRITTON (1955), AWAD and ABDEL LATIF (1963) and MARTINOVICH and WOODHOUSE (1971). However, this decrease did not influence dramatically the level of copper and other elements as sodium, chlorides and calcium. Potassium, on the other hand, showed a tendency to decrease and reached in cases of hypophosphataemia animals  $4.93 \pm 0.39$  m. Eq/Lt in cattle and  $4.36 \pm 1.97$  m. Eq/Lt. in buffaloes. It was expected a rise but not a fall as simply because of the haemolysis ensued. In fact there is no explanation to be offered for this behaviour.

In babeiosis, serum potassium was increased to  $6.19 \pm 2.13$  and  $6.06 \pm 0.38$  m. Eq./Lt in cattle and buffaloes. This is in agreement with that reported by JERICHOW and JUNGMAN (1969). The increase of potassium level may be due to the destruction



of great number of red blood cells as it is known that the potassium concentration in the red blood cells is very high (KANEKO and CORNELIUS, 1970).

Serum inorganic phosphorus, sodium and calcium, on the other hand, was slightly diminished. This is in agreement with that reported by EL-ALLAWY (1975). The decrease in sodium may be due to loss of this electrolyte as a result of diarrhoea which was observed in some individuals of this group.

Copper and chlorides remained unchanged in both cattle and buffaloes. The available literature lacks any reports discussing the role of copper and chlorides in such cases.

In case of nephritic animals, the potassium level has a tendency as shown in (table 5). The obtained result was in agreement with that reported by MIER (1963) and HOE and OSHEA (1965) who attributed that hyperkalaemia could occur when the kidney is not capable to excrete this cation.

The level of sodium was not affected in cases of nephritis, embolic nephritis and in renal calculi (table 5), possibly because there were no extensive changes in the parenchyma to influence the level of serum sodium as it is known that kidneys are less capable than normal for retaining sodium and considerable daily loss may occur possibly due to the increase of osmotic load on each surviving nephron which make it unable to lower the sodium concentration of the tubular fluid below a relatively high fixed values.

The level of chlorides were not changed in all affected cases except in those suffering from embolic nephritis where it was noticed that there was slight increase (113.78 m.Eq/Lt.) and generally serum chloride increase in severe kidney affection (HOE and O'SHEA, 1965).



REFERENCES

- Allbritton, E.C. (1955): Standard values in blood. 1st. Ed. W.B. Saunders company, Philadelphia and London.
- Awad, F.I. and Abd El-Latif, K. (1963): The first record of a disease condition in Egyptian buffaloes stimulating post-parturient haemoglobinuria Vet. Rec. 75: 288 - 300.
- Brocklesby, W.D., Harnessl, E. Sylvia, and Sellwood, A. R. (1971): The effect of age on the natural immunity of cattle to babesia divergens. Res. Vet.Sci. 12: 15-19.
- Clark, E.P., and Collip, J.B.(1925): A study of Tisdall method for the determination of blood serum calcium with a suggested modification J. Biol. Chem. 63: 461.
- Glegg, F.G., and Evans, R.K. (1962): Haemoglobinuria of cattle associated with the feeding of Bressinae species. Vet.Rec., 741: 169-176.
- Coles, E.H., (1967): Veterinary Clinical Pathology.1st.Ed., W.S.Saunders company, Philaderlphia, and London.
- Dorner, J.L. (1967): A haematologic study of Babesiosis of dog. Amer.Vet.Clinic.Path. 67.
- El-Allawy T. (1973): Studies on bovine Piroplasmosis in Assiut.Thesis, Faculty of Vet.Med. Assiut University, Assiut, Egypt, A.R.E.
- Fisk, and Subbarow (1925): Determination of inorganic phosphorus. J. Rial. Chem. 66: 375.
- Hawk, P.B. and Osar, B.L. (1965): Physiological chemistry. 14th. Ed. The Blakiston division New York. Toronto, Sydney, London.



# BOVINE HAEMATO- AND HAEMOGLOBINURIA

- 171 -

- Hoe, C.M. and Oashea, J.D. (1965): The correlation of biochemistry and histopathological changes in kidney disease in Dog.
- Jerichow, H. and Jungman, R. (1969): Harmful effects of *Babesia divergens*. 1-Content of K, CaMg, and Fe in the blood of naturally infected cattle. Mh. Vet. Med. 24: 732.
- Kaneko, J.J. and Cornelius, C.E. (1970): Clinical biochemistry of domestic animals. 2nd. Ed. Academic press, New York and London.
- Martyian, E.M. (1956): Piroplasmosis in buffaloes. Thrud. Arm-yan. Nauchno-issled. Inst. Zhivotravod-Stive-Veterinari, 1: Ser. Vet. 145.
- Martinovich, D., and Woodhouse, D.A. (1971): Post-parturient haemoglobinuria in cattle: A Heinz body haemolytic, anaemia. N.Z.Vet. J., 19 : 259 - 263.
- Meier, H. (1963): Clinical Biochemistry of Domestic animals. 1st. Ed. by Cornelius, C.E. and Kaneko, J.J., Academic press, New York and London.
- Neitz, W.O. (1938): The destruction of *Babesia canis* by the neutrophilia and large mononuclear leukocytes. Onder. J. Vet. Sci. 10 - 33.
- Rosenberger, G. (1964): Die klinische untersuchung des Rindes verlag Paul Parey- Berlin, Hanubng.
- Zak;D., and Ressler, N., (1956): Photometric determination, of the copper concentration in serum. Anal. Chem. 28 : 1158.





**Table 1**

**Physical Examination of Urine of Cattle  
And Buffaloes In Various Diseases  
Accompanied By Haematouria & Haemoglobinuria**

Disease	Animals species	NO. of anim-als.	Reaction (pH)	Specific Gravity.	Colour
Hypophosphataemia	Cattle	15	8.1 (7.9-8.5)	1023 (1015-1028)	Brownish, black, brown, coffi&pink.
	Buffa- loes	19	8.0 (7.5-8.5)	1023 (1019-1033)	Coffi, pink Brownish
	Cattle	18	7.8 (7.5-8 )	1027 (1020-1036)	Reddish Brown Coffi
Babesiosis	Buffa- loes	5	8 (8 -8 )	1022 (1019-1025)	Brownish yell- ow -Reddish Brown -Coffi
	Cattle	5	8.4 (8 -9 )	1028 (1023-1031)	Reddish yell- ow-Reddish Creamy-dark yellow.
Cystitis	Buffa- loes	12	8.5 (8 -9 )	1023 (1022-1036)	Reddish yell- ow-Reddish creamy-creamy yellow.
	Cattle	4	8.4 (8 -9 )	1037 (1030-1040)	Slight reddish and greenish yellow.
Different Kidney Affection	Buffa- loes	14	8 (7-8.5 )	1038 (1030-1040)	Reddish & greenish yellow cloudly
	Cattle	18	8.1 (8-8.5 )	1033 (1030-1035)	Yellow (Pale-dark)
Normal Value	Buffa- loes	27	8 (8 - 8 )	1033 (1030-1035)	Yellow (Pale-dark)





**Table 2**

Chemical Examination of Urine  
Of Cattle. And Buffaloes In  
Various disease Accompanied  
By Haematuria & Haemoglobinuria.

Disease	Animal species	NO. Of animals	Blood or Haemoglobin.	Albumin.	Sugar.	bile (salt+ pigment)
Hypophosphataemia	Cattle	15	-ve for . Haemoglobin	7 +ve 8 -ve	-ve	-ve
	Buffa-	19	+ve for Haemoglobin	12 +ve 7 -ve	-ve	-ve
Babesiosis	Cattle	18	+ve for Haemoglobin	+ve	-ve	-ve
	Buffa- loes.	5	+ve for Haemoglobin	+ve	-ve	-ve
Cystitis	Cattle	5	+ve for blood	+ve	-ve	-ve
	Buffa- loes.	12	+ve for blood	+ve	-ve	-ve
Different Kidney Affection	Cattle	4	+ve for blood	+ve	-ve	-ve
	Buffa- loes	14	+ve for blood	+ve	-ve	-ve
Normal Value	Cattle	18	-ve	-ve	-ve	-ve
	Buffa- loes.	27	-ve	-ve	-ve	-ve





**Table 3**

**Clinical Examination of Cattle And  
Buffaloes Suffering From Various  
Disease Accompanied By Haematuria  
And Haemoglobinuria.**

<b>Disease</b>	<b>Animals species</b>	<b>NO. of animals</b>	<b>Tempe- rature °C</b>	<b>Pulse Rate/m</b>	<b>Respiration Rate/m</b>
<b>Hypophosphataemia</b>	<b>Cattle</b>	<b>15</b>	<b>38.2 -(38-40.5)</b>	<b>84 (60-112)</b>	<b>22 (16-26)</b>
	<b>Buffal- oes</b>	<b>19</b>	<b>38.5 (38-38.9)</b>	<b>71 (62-82)</b>	<b>17 (14-20)</b>
<b>Babesiosis</b>	<b>Cattle</b>	<b>18</b>	<b>40-91 (38.9-40.5)</b>	<b>91 (74-104)</b>	<b>27 (20-32)</b>
	<b>Buffal- oes</b>	<b>5</b>	<b>39.2 (38.6-39.8)</b>	<b>81 (77-88)</b>	<b>18 (16-20)</b>
<b>Cystitis</b>	<b>Cattle</b>	<b>5</b>	<b>38.9 (38.3-39.6)</b>	<b>74 (68-86)</b>	<b>28 (24-32)</b>
	<b>Buffal- oes</b>	<b>12</b>	<b>39.5 (38.9-40.6)</b>	<b>77 (68-86)</b>	<b>28 (16-22)</b>
<b>Different &amp; Kidney Affection</b>	<b>Cattle</b>	<b>4</b>	<b>38.3 (38-38.5)</b>	<b>74 (68-78)</b>	<b>19 (16-22)</b>
	<b>Buffa- loes</b>	<b>14</b>	<b>39.6 (38.5-40.5)</b>	<b>79 (77-96)</b>	<b>28 (16-32)</b>
<b>Normal Value</b>	<b>Cattle</b>	<b>18</b>	<b>38.2 (38-38.5)</b>	<b>70 (62-80)</b>	<b>20 (16-22)</b>
	<b>Buffa- loes</b>	<b>27</b>	<b>38.5 (38-38.7)</b>	<b>68 (56-76)</b>	<b>20 (16-28)</b>





Table 4

Blood Picture of Cattle And Buffaloes In Various  
Disease Accompanied By Haematuria & Haemoglobinuria.

Disease	Animals species	No. of animals	Haemogl- obin g %	P.C.V. %	R.B.Ces million/ cu mm	W.B.Ces Thousands/ cu mm
Hypophosphataemia	Cattle	15	6.3	16	2.33	7.8
	Buffaloes	19	(5 - 10.5) 6.8	(11 - 27) 17.9	(1.51 - 5.49) 2.65	(6.4 - 14.0) 7.5
Babesiosis.	Cattle	18	(5 - 10) 8.2	(13 - 33) 24.5	(1.71 - 5.21) 3.54	(5.4 - 9.2) 8.6
	Buffaloes	5	(5.8-10.5) 6.4	(13 - 36) 16	(1.73 - 5.63) 2.20	(7.2 - 9.6) 9.3
Cystitis	Cattle	5	(6 - 6.7) 10.4	(13 - 18) 22.1	(1.98 - 2.47) 6.45	(8.6 - 10.4) 9.8
	Buffaloes	12	(10-11) 10.05	(29 - 36) 30.95	(4.32 - 6.96) 5.98	(9.3 - 10.8) 10.1
Different kidney affection.	Cattle	4	(9 - 11) 9.6	(23 - 35) 27.8	(4.32 - 7.21) 5.43	(8.2 - 12.2) 8.6
	Buffaloes	14	(8.5-10.5) 9.8	(23 - 31) 30.1	(2.10 - 6.10) 6.87	(5.8 - 14.0) 7.7
Normal	Cattle	18	(7.5 - 11) 10.5	(24 - 35) 32	(4.28 - 8.28) 6.12	(5.4 - 9.6) 7.6
	Buffaloes	27	(9.5-11) 9.5	(28 - 38) 30	(5.96 - 6.45) 5.83	(5.6 - 0.8) 7.6
			(3- 11.5)	(27 - 40)	(4.12 - 8.72)	(5.4 - 9.2)

**Table 5**  
 Serum Inorganic Constituents Of Cattle And  
 Buffaloes In Various Disease Accompanied  
 By Haematuria & Haemoglobinuria.

Disease	Animals Species	NO. of animals	Sodium m. Eq/Lt.	Potassium m. Eq/Lt.	Chlorides m. Eq/Lt.
Hypophosphataemia	Cattle	15	166.2 $\pm$ 3.37	4.93 $\pm$ 0.39	118.8 $\pm$ 8.28
	Buffaloes	19	156.95 $\pm$ 32.88	4.36 $\pm$ 1.97	107.09 $\pm$ 7.55
Babesiosis	Cattle	13	149.37 $\pm$ 7.75	6.19 $\pm$ 2.13	116.66 $\pm$ 6.33
	Buffaloes	5	148.6 $\pm$ 9.21	6.66 $\pm$ 0.30	112.54 $\pm$ 7.47
Cystitis	Cattle	5	154.2 $\pm$ 9.73	8.26 $\pm$ 1.12	114.06 $\pm$ 7.62
	Buffaloes	12	147.75 $\pm$ 16.86	6.85 $\pm$ 1.22	112.23 $\pm$ 8.707
Differant Kidney Affection	Cattle	4	166 $\pm$ 8.17	8.63 $\pm$ 2.32	106.3 $\pm$ 0.02
	Buffaloes	14	139.6 $\pm$ 7.54	7.29 $\pm$ 1.92	111.5 $\pm$ 12.04
Normal Value.	Cattle	18	191 $\pm$ 68.94	5.17 $\pm$ 1.48	113.6 $\pm$ 8.12
	Buffaloes	27	157.96 $\pm$ 32.49	5.62 $\pm$ 2.1	106.9 $\pm$ 0.48

$\pm$  Standard error.



Table 6

Serum Inorganic Constituents And Copper Of  
Cattle And Buffaloes In Various Diseases  
Accompanied By Haematuria & Haemoglobinuria.

Disease	Animals Species	No. of animal	Phosphorus mg. %	Calcium mg. %	Copper mg % (Micrograms)
(Hypophosphatemia)	Cattle	15	1.26 ± 0.4**	9.6 ± 0.16	167.3 ± 46.97
	Buffaloes	19	1.18 ± 0.56**	10.0 ± 0.28	167.3 ± 46.97
Metastasis	Cattle	18	4.14 ± 2.57	8.9 ± 0.26	162.67 ± 41.8
	Buffaloes	5	3.62 ± 0.58	9.5 ± 0.86	162.66 ± 41.2
Cystitis	Cattle	5	5.18 ± 0.86	-----	165.08 ± 52.11
	Buffaloes	12	4.77 ± 1.0	-----	165.2 ± 51.8
Different Kidney Affection	Cattle	4	3.3 ± 1.56	-----	113.32 ± 33.0
	Buffaloes	14	4.54 ± 1.48	-----	123.6 ± 40.2
Normal Value	Cattle	18	5.59 ± 1.25	9.7 ± 0.17	161.6 ± 46.6
	Buffaloes	27	4.02 ± 1.03	10.9 ± 1.08	143.49 ± 49.4

\* P &lt; 0.05

\*\* P &lt; 0.01

