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غازات الدم ، الاتزان الحمضي القاعدى والاليكتروليت في الاغنام والماعز السليمة

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أجريت قياسات غازات الدم والتوازن الحمضي - القاعدى وكذلك الاليكتروليت على عشرة رؤوس من الأغنام وكذلك عشرة من الماعز السليمة . ولقد كانت المعدلات بالنسبة للاغنام على النحو التالي :
تركيز الاس الهيدروجين ( ) ٧ر٣٧٧ ، ضغط ثاني أكسيد الكربون ٨٠ر٤ مل زئبق ، ضغط الاكسجين ٠٧ر٣٤ زئبق البيكربونات ٧ر٢٥ مل جزئ/لتر، ثاني أكسيد الكربون الكلي ٨٤ر٢٥ مل جزئ/لتر وزيادة القاعدة + ٢ر١ مل جزئ/لتر .

وكانت المعدلات بالنسبة لدم الماعز على النحو التالي :

تركيز الاس الهيدروجين ( ) ٧ر٣٨ ، ثاني أكسيد الكربون ٥٣ر٤٠ مل زئبق الاكسجين ٦٣ر٤١ مل زئبق ، البيكربونات ٣٧ر٢٤ جزئ/لتر ثاني أكسيد الكربون الكلي ٣٧ر٢٥ مل جزئ وزيادة القاعدة + ٥ر مل جزئ/لتر .

وكانت معدلات الصوديوم ، البوتاسيوم ، والكلوريد في دم الاغنام ٠٦ر١٢٧ مل جزئ/لتر ، ١٢ر٤ مل جزئ ، ٦ر١١٠ مل جزئ في اللتر وفي الماعز كان الصوديوم ٤ر١٢٥ مل جزئ لتر ، البوتاسيوم ٠٢ر٣ مل جزئ/لتر والكلوريد ٦ر١٠٨ مل جزئ في اللتر .

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BLOOD GASES, ACID-BASE BALANCE AND ELECTROLYTES IN HEALTHY SHEEP AND GOATS

(With 3 Tables)

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SUMMARY

Blood gas tensions, acid-base measurements and electrolytes were determined in 10 healthy sheep and 10 healthy Goats. These values for sheep were blood pH 7.377±0.01, carbon dioxide tension (Pco) 45.08 ± 1.84 mmHg; oxygen tension (Po) 34.07 ± 2.61 mmHg; bicarbonate (Hco) 25.71 ± 2.01 mmol/L; total carbon dioxide (Tco) 25.84 ± 2.07 mmol/L and Base Excess (B.E.) ± 1.02 ± 0.54 mmol/L. While the values for Goats were pH 7.383 ± 0.03; Pco (40.53 ± 6.2 mmHg); Po (41.63 ± 4.04 mmHg); Hco (24.37 ± 1.89 mmol/L; Tco (25.73 ± 2.07 mmol/L.) and B.E. (+ 0.5 ± 0.38 mmol/L). Serum Sodium, potassium and chloride in sheep were 127.6 ± 3.9 mmol/L.; 4.12 ± 0.79 mmol/L and 110.60 ± 3.02 respectively. In Goats the values were Na (125.40 ± 4.59 mmol/L); K (3.02 ± 0.19 mmol/L) and chloride (108.6 ± 4.4 mmol/L).

INTRODUCTION

The acid-base balance of the body fluid is important because the chemical reactions of the body, being controlled by enzymes, are very greatly influenced by small changes in pH (TASKER, 1969). When the pH changes normal metabolic reactions are altered and body processes are impaired. Serious disorders of acid-base balance occur in several clinical disorders in cattle, sheep and goats (HILLS, 1974). Since acid-base balance has been a subject of considerable interest to bovine practitioners in recent years, it is important that some aspect of physiology be reviewed.

It must be remembered that bicarbonate-carbonic acid system is the most important buffer system in the body and changes in this system reflect changes of acid-base balance of the body as a whole (HILLS, 1974 and CLARY, 1981). The carbonic acid level is controlled by respiration, so inadequate ventillation results in increased carbonic acid and acidosis, hyperventilation results in excessive removal of carbonic acid from the blood and alkalosis (MEDWAY, 1969 and HILLS, 1974). Bicarbonate concentration of the blood is controlled by renal and other non-respiratory processes (COLES, 1974). Retention of acid or base is reflected by changes in serum bicarbonate, the base being mainly sodium or potassium (TASKER, 1969 and HILLS, 1974), this supply of base which is available to neutrlize acid is termed alkali reserve (RUSSEL et al. 1972 and HILLS, 1974). When excessive amounts of bicarbonate are from the body as in diarrhoae acidosis develops; also when the concentration of bicarbonate becomes abnormally high as in certain type of ruminal and abqmasal disorders; alkalosis results (TASKER, 1969).

A new concept was introduced by ASTRUP et al. (1960) for quantitative description of acid-base abnormalities in the blood, this concept; the blood base excess (B.E.), which was difined as the number of mmol/L of acid or (minus the amount to base required to titrate a litre of blood

to normal pH (DONAWICK and BAUE, 1968; and HILLS, 1974). For human blood base excess is defined as zero when the pH 7.38, the Pco_2 is 40 mmHg and the temperature is 38 C (DONAWICX and BAUE, 1968 and HILLS, 1974). Positive values indicate an exeess of base or deficit of fixed acids, while negative value indicate a deficit of base or excess of fixed acids (DONAWICK and BAUE, 1968).

Ideally the acid-base balance of the body is evaluated by determination of blood pH, oxygen tension (Po_2), carbon dioxide tension (Pco_2); bicarbonate (Hco), total carbon dioxide (Tco_2) and base excess (B.E). This information provides a basis for recognition of acid-base balance, acidosis and alkalosis. In addition this information indicates the abnormalities are the result of abnormal respiration, digestive or due to metabolic factors.

It is not within the scope of this paper to discuss in detail the chemistry of acid-base balance and blood gases. An effort is made herein to record the values of blood gases and acid-base measurements in healthy Egyptian sheep and goats, Such data have been not established, and such informations are necessary in dealing with some diseases of sheep and goats.

MATERIAL and METHODS

Ten clinically healthy native breed Egyptian sheep, and also ten healthy native breed goats were used in this investigation. All animals used; were subjected to carefull clinical examination before use. From each animal two-millilitre samples of jugular venous blood were collected anaerobically into syringe whose dead space had previously filled with 1:1000 sodium heparin. These samples were immediately placed on ice-bath and processed within 45 minutes of collection.

Blood gases measurements were performed using CORNING pH- BLOOD GAS analyzer Model 168. The analyzer directly measured at 37°C, blood pH, oxygen tension (Po_2 mmHg) and carbon dioxide tension (Pco_2 mmHg). Bicarbonate (Hco_2 mmol/L) total carbon dioxide (Tco_2 mmol/L) and base excess (B.E. mmol/L) were calculated automatically by means of 168- BLOOD GAS ANALYZER.

The pH, Pco_2 and Po were adjusted for each animal rectal temperature using inbulit correction equation.

Another blood samples were collected from each animal for serum separation, Serum samples were used for serum electolytes (Sodium, Potassium and Chloride) determination.

RESULTS

The mean values ± S.D. of various measurements, blood pH, carbon dioxide tension (Pco_2), oxygen tension (Po_2), bicarbonate (Hco_3), total carbon dioxide (Tco_2) and base excess (B.E) for healthy sheep and goats are present in tables (1) and (2). The mean values of blood gases and acid-base measurements in a healthy sheep for pH, carbon dioxide tension, oxygen tension bicarbonate, total carbon dioxide and base excess were 7.377 ± 0.01, 45.08 ± 1.84 mmHg, 34.07 ± 2.61 mmHg, 25.71 ± 2.0 mmol/L, 25.84 ± 2.07 mmol/L and + 1.02 ± 0.5 mmol/L respectively. While the mean values of the same parameters in a healthy goats were 7.383 ± 0.03, 40.53 ± 6.28 mmHg, 41.63 ± 4.04 mmHg, 24.37 ± 1.89 mmol/L. 25.73 ± 2.07 mmol/L and + 0.5 ± 0.38 mmol/L respectively. In Table (3) illusterated the mean values of serum sodium, potassium and chloride for healthy sheep and goats. The values for sheep were sodium (127.6 ± 3.92 mmol/L); potassium (4.12 ± 0.79 mmol/L) and chloride (110.6 ± 3.02 mmol/L). While the mean values for goats were 125.4 ± 4.59 mmol/L; 3.02 ± 0.19 mmol/L and 108.6 ± 4.4 mmol/L respectively.

DISCUSSION

Blood pH has been of particular interest in bovine and ovine medicine, as the problems of digestive disturbance which commonly followed acute ruminal impaction and metabolic acidosis. The present research indicate, that the blood pH for sheep and goats was 7.377 and 7.383 respectively, these values lie within the range given by ENGLISH et al. (1969) and MITCHEL and WILLIAMS (1975). Similar results have been taken in cattle (McSHERRY and GRINYER, 1954 and FISHER et al. 1980).

Oxygen tension in venous blood of sheep and goats in Egyptian breed, do not appear to have been established. The data given in this investigation seem to be disagreed with the finding published by MITCHELL and WILLIAMS (1975), they gave a mean value of 89.2 ± 1.36 mmHg for arterial blood in adult sheep, Variations could be explained due to difference in the type of sample used.

Carbon dioxide tension in sheep and goats in this investigation was in agreement with previous data after (ENGLISH et al. 1969; COLES, 1974 and MITCHEL and WILLIAMS, 1975), Lower values of arterial carbon dioxide (33.6 mmHg) was stated by FISHER et al. (1980). It could concluded that the carbon dioxide tension in venous blood is higher that the values of arterial blood.

The values of bicarbonate and total carbon dioxide for adult sheep and goats, lie within the ranges reported in other studies (MEDWAY, 1969; COLES, 1974 and MITCHEL and WILLIAMS, 1975).

Regarding to the valuees of base excess (B.E) in sheep (+ 1.02 mmol/L) and goats (+ 0.5 mmol/L). These animals tend to slightly alkalotic. Reasons for this alkalinity are unknown, but possible explanation may be due to hyperventillation as in results reported by DONAWICK and BAUE, (1968). Serum electrolytes values for healthy sheep and goats in this study are in agreement with the ranges and mean values reported in other studies (McSHERRY and GRINYER, 1954), with exception, the value of serum sodium in goats which had a low values in with the data (146.0 mmol/L) published by LEWIS, (1976).

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Table (1): Values of venous blood gases and acid-base balance in healthy sheep

No.	pH	Pco2 mmHg	Po2 mmHg	Hco3 mmol/L	Tco2 mmol/L	B.E. mmol/L
1	7.367	48.00	39.41	27.50	28.4	+ 1.9
2	7.351	44.32	33.10	24.50	25.8	+ 0.9
3	7.393	45.28	33.23	28.36	29.7	+ 0.9
4	7.363	42.83	37.00	24.37	25.6	+ 0.8
5	7.380	43.35	33.90	25.61	26.3	+ 1.2
6	7.392	45.62	39.44	23.74	24.4	+ 1.9
7	7.360	48.52	31.82	24.30	24.5	+ 1.9
8	7.371	44.27	31.20	21.22	23.5	+ 0.8
9	7.367	44.41	34.11	25.23	24.8	+ 0.9
10	7.351	43.36	31.22	24.40	25.6	+ 0.8
Mean	7.377	45.08	34.07	25.71	25.84	+ 1.02
± S.D	0.018	1.84	2.61	2.01	2.07	0.54

ble (2): Values of venous blood gases and acid-base balance in healthy goats

No.	pH	Pco2 mmHg	Po2 mmHg	Hco3 mmol/L	Tco2 mmol/L	B.E. mmol/L
1	7.374	41.12	45.90	24.10	25.4	+ 0.5
2	7.369	44.72	41.70	25.71	27.1	+ 0.5
3	7.399	37.92	41.35	23.43	24.6	+ 0.5
4	7.380	39.14	38.91	20.33	21.4	+ 0.5
5	7.374	41.82	52.20	24.91	26.3	0.0
6	7.333	48.42	34.83	25.60	27.1	+ 0.0
7	7.355	49.10	28.91	27.40	28.9	+ 1.5
8	7.396	37.64	44.00	23.01	26.1	+ 0.9
9	7.431	37.52	37.99	24.91	26.8	+ 0.5
10	7.425	37.10	42.62	24.45	25.6	+ 1.0
Mean	7.383	40.53	41.63	24.37	25.73	0.5
± S.D	0.030	6.283	4.04	1.89	2.07	0.38

Table (3): Sodium, Potassium and chloride values in serum of healthy sheep and goats

Nr.	Animals used					
	Sheep			Goat		
	Sodium mmol/L	Potassium mmol/L	Chloride mmol/L	Sodium mmol/L	Potassium mmol/L	Chloride mmol/L
1	130	4.5	106	120	2.8	116
2	135	5.0	112	125	2.8	116
3	120	3.0	112	118	3.0	109
4	126	3.5	112	121	3.3	109
5	126	4.1	110	123	3.0	103
6	128	4.5	110	130	3.0	109
7	125	5.0	116	129	3.1	129
8	127	3.5	113	130	3.0	110
9	129	5.0	112	130	3.0	110
10	130	3.5	108	129	3.0	102
Mean	127.6	4.12	110.6	125.4	3.02	108.6
S.D.	± 3.92	± 0.79	± 3.02	± 4.59	± 0.19	± 4.4