The study of biochemical ions parameters of non diarrheic and diarrheic Iraqi Awassi suckling lambs

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Abstract

This study was planned to investigate some serum electrolytes and ions such as sodium, potassium, chloride, calcium and magnesium in 100 Awassi un weaned lambs which compared with healthy lambs clinically. The selected cases were five days to two months of age which were divided into10 non diarrheic lambs as control and 90 diarrheic lambs group. Their cases were collect in Karbala city/ Iraq November 2015 to April 2016. The biochemical tests for diarrheic animals showed these changes with significant ($P \leq 0.05$) hyponatremia, hyperkalemia, hypochloremia, hypocalcaemia with a non-significant increase in magnesium level. The values in diarrheic lambs group include, Sodium (Na+) 112.32±3.36, Potassium (K+) 4.15±3.31 mmol/L, chloride (Cl-) 95.50±2.33 mmol/L, Calcium (Ca++) 1.94±0.08 mmol/L and Magnesium (Mg++) 21.1±0.10 mmol/L, compared with non diarrheic lambs were 137.18±4.11 (mmol/L), 3.92±0.25 (mmol/L), 105.041±3.10 (mmol/L), 2.73±0.35 (mmol/L) and 1.18±0.129 (mmol/L) respectively. The current study has concluded diarrhea in lambs causes abnormal electrolytes changes.

Key words: lambs, biochemical parameters, sodium, potassium, chloride, calcium and magnesium
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دراسة لبعض القيم الكيموحيوية في عدد من الحملان العواسية الرضيعة العراقية الطبيعية والتي تعاني من الإسهال

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الخلاصة

أجريت هذه الدراسة لمعرفة قيم الشوارد والأيونات الطبيعية لتسعون من الحملان العواسية الغير المفطومة مصابة بالإسهال ومقارنتها مع عشرة حملان صحية سريريا من نفس السلالة. وبأعمار تتراوح بين 5 أيام إلى شهرين في مدينة كربلاء/ العراق للفترة الممتدة من تشرين الثاني لعام 2015 ولغاية نيسان لعام 2016. وضحت هذه النتائج لاختبارات الشوارد للحيوانات التي تعاني من الإسهال وجود نقصان في مستوى الصوديوم (Na^+) 112.32±3.36 والكلوريد (Cl^-) 95.50±2.33 والكالسيوم (Ca^{++}) 1.94±0.08 في مصل الدم وزيادة في البوتاسيوم الدم (K^+) 4.15±3.31 مع زيادة وبدون فرق معنوي في المغنيسيوم الدم (Mg^{++}) 0.10±1.21 مل مول/ لتر مقارنة مع مجموعة الحملان التي لا تعاني من الإسهال فكانت القيم 3.92±0.25، 137.18±4.11، 2.73±0.35، 1.18±0.129، 105.04 ± 3.10 مل مول/ لتر على التوالي. يستنتج من هذه الدراسة بان الإسهال في الحملان يسبب تغيرات غير طبيعية في الكهارل والأيونات.

الكلمات المفتاحية: الحملان، القيم الكيموحيوية، الصوديوم، البوتاسيوم، الكلوريد، الكالسيوم والمغنسيوم.

Introduction

The diarrheic animals loosed fluid, rapidly dehydrated and suffered from electrolyte failure, acidosis and infection might reason early injure of gut but death from diarrhea usually result from lack of fluids, acidosis and failure of electrolytes (1). The microorganisms give rise to destruction entero-gastric epithelium causing fluid loss, rapidly dehydration and acid-base imbalance together high acidity. These disturbances

were considered deadly cause in scouring lamb(2). The various hematological examinations are evaluated them, but everyone must determine alone for example ionized calcium, blood sodium potassium, chloride, calcium, magnesium and phosphorus(3). Diarrhea lead to biochemical changes such as hyponatremia, hypocalcemia, hyperkalemia (4). Hyponatremia and natremia are caused by persistent vomiting or diarrhea (5). Another reason of death has been grown from acidity and electrolyte imponderables where trace on heart activity with an irregular pulse. Hypochloremia can result in hyperirritability, tetany or muscular excitability, slowed respirations and hypotension secondary to fluid loss(6). Diarrhea, vomiting and digestive suction, kidney failure along with adenial of salt, overdose diuretics, chronic aerobic acidosis, diabetic mellitus, sweating, hyponatremia and hypo-osmolarity related to antidiuretic hormones and salt exertion nephropathy(7).

Materials and Methods

Samples of blood be collect starting the jugular vein by via tubes from Ninety diarrheic Awassi lambs and ten non diarrheic, clinically, healthy from the same breed and within the same age range, were used as a control group aged from 5 days to 2 months in Karbalaa city- Iraq. Blood sample was taken, the skin was disinfected with alcohol 10% concentrate, a blood sample collected without anticoagulant was collected from the jugular vein by using a vacationer tube. The collected blood samples were placed at room temperature for 60 minutes. The samples were centrifuged (4000 round/min), the serum only was transferred with a pipette to another test tube to analyzed to determine (serum parameters, sodium, potassium, chloride, calcium and magnesium),The samples of serum were analyzed by spectrophotometer apparatus and use specific kit in the branch of Internal and Preventive Medicine/ Baghdad University. The results were statistical analyzed by using SPSS (version 20) program by using ANOVA with a significant differences ($P<0.05$).

Results and Discussion

First normal serum electrolytes level in non-diarrheic suckling lambs was sodium (Na) 137.18±4.11, potassium (K^+) 3.92±0.25, chloride (Cl) 105.04±3.10, calcium (Ca) 2.73±0.35 and magnesium (Mg) 1.18±0.129 (mmol/L) where agreement with (13). The electrolytes imbalance of diarrheic suckling lambs including serum sodium (112.32± 3.36) and chloride (95.50±2.33) concentrations were significant ($P\leq0.05$) decrease along with significant increase in serum potassium (4.15± 3.31) as in table 1.

Table (1) Electrolyte concentrations in Diarrheic and Non-diarrheic lambs

suckling lambs	Electrolytes		
	Sodium (mmol/L)	Potassium (mmol/L)	Chloride (mmol/L)
Non-diarrheic lamb	137.18± 4.11 ^{A}	3.92±0.25 ^{B}	105.04± 3.10 ^{A}
Diarrheic lamb	112.32±3.36 ^{B}	4.15± 3.31 ^{A}	95.50±2.33 ^{B}

Capital letter mean significant differences (p≤0.05).

Hyponatremia, hypochloriemia in diarrheic lamb was attributed to direct loss of sodium and chloride ions via feces as well as failure of intestinal absorption (14). Electrolyte difference and acidosis involve heart role, and heart disrhythmia is one of the first causes of death in diarrheic lamb (15). Hyperkalemia in diarrheic lamb could be attributed to increasing renal tubular reabsorption of potassium in response to acidosis. Also it could be attributed to oligouria or anuria in which kidney failed to eliminate excess potassium (16). Blood calcium (1.94±0.08) significant decrease and no significant ($P\leq 0.05$) increase in blood magnesium (1.21±0.10) as in table 2.

Table (2) Calcium and magnesium levels in sera of diarrheic and non-diarrheic lambs

suckling lambs	Electrolytes	
	Calcium (mmol/L)	Magnesium (mmol/L)
Non-diarrheic lamb	2.73±0.35 ^{A}	1.18±0.129 ^{A}
Diarrheic lamb	1.94±0.08 ^{B}	1.21±0.10 ^{A}

Capital letter mean significant differences (p≤0.05).

The significant decline in the calcium level perhaps due to malabsorption also its failure in the gastrointestinal tract (17). Diarrhea is the most common outcome of gastrointestinal disorder (gastritis, colitis, gastric dilation) and it results in increase fluids and electrolytes loss into the gut lumen so malabsorption may increase with bowel hypo motility disorder these defects lead to increase the level of magnesium (18). Also neonatal lambs with high magnesium level born to mothers treated with magnesium sulfate for hypocalcaemia, which passes through the placental circulation (19). The unabsorbed magnesium reaches the intestine or colon it can attract water from the nearby tissue through osmosis so too much magnesium can produce osmotic diarrhea and distention of the bowel (20). Increase in magnesium take place seldom due to the renal is especially infected in excreting more magnesium. It generally defects just with renal failure cases which are give salts of magnesium or which take medicine that include magnesium (21). In conclusion Serum analysis of diarrheic lamb showed significant decrease in serum Na^{+}, Cl^{-} and increase in K^{+}, while a significant decrease of Ca^{++} level and no significant increase in Mg^{++}.

References

1. Joshua, P. A.; Sweeny, U. M.; Ryan, I. D.; Robertson, C. & Jacobson, C. (2011). Prevalence and on-farm risk factors for diarrhoea in meat lamb flocks in Western Australia. Vet. J., 10: 36-42.
2. Radostits, O. M.; Gay, C. C.; Hinchcliff, K. W. & Constable, P. D. (2007). Veterinary Medicine A textbook of the diseases of cattle, horses, sheep, pigs and goats. 10 Ed. B. Saunders, London, New York, Philadelphia, Sydney and Toronto.
3. Chernecky, C. C. & Berger, B. J. (2013). Electrolytes panel-blood. Laboratory Tests and Diagnostic Procedures. 6th ed. St. Louis, MO: Elsevier Saunders, PP. 464-467.
4. Ghanem, M. M. & Abd El-Raof, Y. M. (2006). Clinical and haemato-biochemical studies on lamb coccidiosis and changes following Amprolium and sulphadimthoxine therapy. Benha Vet. Med. J., 16: 59-63.
5. Srilakshmi, B. (2006). Nutrition Science. 2nd ed. New Age International. P. 318.
6. Daniels, R. (2010). Delmar's Guide to Laboratory and Diagnostic Tests. 2nd Ed.
7. Nicoll, D.; McPhee, S. J.; Pignone, M. & Lee, C. M. (2008). Pocket guide to Diagnostic tests. 5th Ed.
8. Henry, R. J. (1974). Clinical Chemistry. Harper & Row new York, Sce. Edit. P. 643.
9. Thomas, l. (2000). Labor and Diagnosis. Auflage. Frankfurt: TH-books Verlagsgesellschaft mbh,(5).
10. Schonfled, R. G. & Lowellen, C. S. (1964). Clin. Chem.. PP. 10-533.
11. Ste, J. & Lewis, W. H. P. (1957). Clin. Chim. Act., 2:576.
12. Gindler, E. (1971). Clin. Chem., 17:662.
13. Manar, H. A. & Wassan, G. (2015). Effect of experimental induced hypocalcemia on electrocardiography and some blood biochemical parameters in ewe. Chapter 4, P. 50.
14. Michell, A. R. (1989). Sodium in health and disease. Vet. Rec., 116: 657-663.

15. Dalir, N. B. & Yaresmaeil, M. (2001). The study of interaction of clinical, biochemical, hematological and lectrocardiographic findings of diarrheic calves. J. Fac. Vet. Med. Tehran Univ., 56: 13-19.
16. Wakwe, V. C. & Okon, K. O. (1995). Plasma electrolyte pattern of calf with protein energy malnutrition and calf with prolonged diarrhea. J. Trop. Paediatr., 41:59-60.
17. Abd El-Raof, Y. M.; Ghanem, M. M. & Galbat, S. (2007). Cryopreservation of rumen protozoa using three different cryoprotectant methods in sheep. The Second Scientific Conference, Fac. Vet. Med., Benha University- Ras Sedr 25-28 January, PP. 314-332.
18. Leong, D. P.; Kleinig, T. J.; Kimber, T. E. & Bardy, P. G. (2006). Severe hypermagnesaemia related to laxative use in acute gastrointestinal graft-versus-host disease. Bone Marrow Transplant., 38(1):71-72.
19. Greenberg, M. B.; Penn, A. A.; Whitaker, K. R.; Kogut, E. A.; El-Sayed, Y. Y. & Caughey, A. B. (2013). Effect of magnesium sulfate exposure on term neonates. J. Perinatol. Mar., 33(3):188-193.
20. Van, J. W. (1991). Endocrine crises. Hypermagnesemia. Crit. Care Clin., 7:215-223.
21. Romani, A. M. P. (2013). Chapter 3. Magnesium in Health and Disease. In: Astrid Sigel; Helmut Sigel; Roland K. O. Sigel. Interrelations between Essential Metal Ions and Human Diseases. Metal Ions in Life Sciences 13. Springer. PP. 49-79.