Kerbala Journal of Veterinary Medical Sciences Issue (2), Volume (1), (2025)

Acidosis Induction in Dogs: Impact on Key Hematological and Biochemical Blood Markers

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Received:5/6/2025 Accepted:20/6/2025 Published: 15/9/2025

***Abstract*— metabolic acidosis is one of the most, common acid-base abnormalities come across in veterinary medicine, in animals, our study investigated the effects of acidosis on blood gases and electrolytes in local dog by histochemical methods. Local dogs were divided into four groups: a control group and three experimental groups treated with hydrochloric acid (75 mmol), HCL (150 mmol) and HCL (300 mmol) respectively. Treatment duration was set for 15 days, with blood samples collected for analysis. Evaluations showed significant changes in the blood test of arterial blood test ABG (hco3, paco2) and in the electrolytes value (cl,ca) , increase lactic acid levels and elevated liver enzymes Aspartate Transaminase (AST) , Alanine transaminase (ALT) with rising of serum levels of urea and creatinine, indicating cellular damage.**

***Keywords* — metabolic acidosis , ABG , creatinine ,urea , AST , ALT.**

INTRODUCTION

THE metabolic acidosis is an earnest electrolyte disorder described by body's acid-base imbalance. Metabolic acidosis has three main basis causes: higher acid production, bicarbonate loss, and a decrease ability of excrete excess acids from the kidneys (1). Metabolic acidosis can drive to acidemia, which is clear as pH of arterial blood then lower 7.35 (2).It is one of the greatest common acid-base encountered abnormalities in veterinary medicine, particularly in animals companion, and can consequence from a multiplicity of clinical conditions. , metabolic acidosis is usually renowned when a patient has a reduced pH of blood (acidosis) beside a parallel-reduced plasma bicarbonate concentration ([HCO3−]. Overall, metabolic acidosis characterizes a dangerous trouble in veterinary field that needs documentation of original causes and appropriate running to reestablish acid-base homeostasis and improve clinical results (3, 4, 5). Disorders of acid-base are disturbances in the hydrogen ion concentration in the plasma homeostasis of Any process that rises the serum hydrogen ion concentration is considered acidotic process. The acidemia is the term used to define serum that is abnormally acidic, and this can be owing to a respiratory acidosis, which includes changes in carbon dioxide, or a metabolic acidosis, which is affected by reduced bicarbonate. Metabolic acidosis is branded by an rise in the hydrogen ion concentration in the systemic, circulation that result in decrease serum bicarbonate level abnormally. Metabolic acidosis displays an underlying condition that need to be fixed to diminish morbidity and mortality (6).

MATERIALS AND METHODS

In this study, 20 healthy local dogs aged 1.5-3 months old and weighing 7-11 kg were used. The dogs purchased from the local market of Karbala. Food and water were provided ad libitum. Dogs were divided to 4 groups, 5 animals for each group and as follows, group one served normal saline as control group. Group 2 treated with dose of 75 mmol of HCL (India) injection via vein for 10 days. Group three treated with dose of 150 mmol of HCL injection via vein for 10 days .Group four were given 300 mmol of HCL via vein for 10 days. During the experiment blood drown in day zero,7and 10 from the femoral artery . .Data were analyzed by one-way ANOVA. In all tests, $p \leq 0.05$ considered statistically significant.

RESULT & DISCUSSION

Small deviancies in acid base balance from the normal ranges can lead to produce marked changes in the activity of enzyme and chemical reactions in the body. The buffer systems that maintain this pH balance are bicarbonate, paco2, electrolytes, liver and kidney. The investigation of this study revealed significant decrease in paco2 and HCO3 and significant increase in levels of (cl,ca,AST,ALT,creatinine and urea).

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Table 1: paco2 levels in experimental animals.

Groups	0 day	7 day	10 day	Lsd
Control (normal saline)	35.32 ±0.043	35.81 ±0.043	35.56 ±0.025	
Treatment 1 (75 mM)	35.36 ±0.043	30.2 ±0.026	29.5 ±0.025	0.0297
Treatment 2 (mM150	36.84 0.043	30.5 ±2.5	29.1 ±0.025	1.561
Treatment 3 (300 mM)	36.7 ±0.025	31.9 ±0.025	28 ±0.025	0.2668
Lsd	0.934	2.42	3.19	

Table 1 shows the levels of carbon dioxide partial pressure, which demonstrates the effectiveness of alveolar ventilation, which is associated with pH levels and increased acidity in the blood. results significantly lower in the 75 mM group than in the control dogs. On the other hand, there were significant differences between the 75 mM and control groups. While the dogs exposed to a dose of 300 mM showed the greatest decrease among all groups.

Table 2: HCO_3 levels in experimental animals.

Groups	0 day	7 day	10 day	Lsd
Control (normal saline)	22.5 ±0.158	22.7 ±0.153	22.6 ±0.158	
Treatment 1 (75 mM)	22.6 ±0.158	20.3 ±0.158	18.4 ±0.132	0.266 8
Treatment 2 (mM150	22.7 ±0.153	20.8 ±0.158	18 ±0.156	0.264 5
Treatment 3 (300 mM)	22.9 ±0.158	20.72 ±0.154	18.2 ±0.132	0.287
Lsd	0.193	0.246	0.146	

The current study showed a significant decrease in the values of HCO3 and at a concentration of 300 mM compared to concentrations of 150 and 75. It was also noted that day 10 of the experiment had the lowest decrease compared to days zero and 10 of the experiment, as in the table 2.

Table 3: CL levels in experimental animals.

Groups	0 day	7 day	10 day	Lsd
Control (normal saline)	107 ±1.581	107 ±1.42	108 ±1.58	
Treatment 1 (75 mM)	107 ±1.581	109 ±2.07	111 ±1.446	2.97 1
Treatment 2 (mM150	108 ±1.42	110 1.63	111 ±1.22	0.26 67
Treatment 3 (300 mM)	107 ±1.58	112 ±1.36	113 ±1.42	0.33 31
Lsd	0.462	0.533	0.419	

Table 3 indicates that CL levels increased significantly in dogs induced with acidosis, especially after days 1 and 10, respectively. It was also noted that the rates of increase gradually increased in concentrations in the 75, 150, and 300 mM groups.

Table 4: Ca levels in experimental animals.

Groups	0 day	7 day	10 day	Lsd
Control (normal saline)	1.50 ±0.015	1.51 ±0.014	1.50 ±0.011	
Treatment 1 (75 mM)	1.52 ±0.015	1.636 ±0.0142	1.79 ±0.0204	0.0083
Treatment 2 (mM150	1.59 ±0.014	1.65 ±0.019	1.81 ±0.018	0.0026
Treatment 3 (300 mM)	1.524 ±0.011	1.674 ±0.013	1.85 ±0.015	0.024
Lsd	0.0072	0.0083	0.0042	

Table 4 shows the levels of Ca, which demonstrates the effectiveness of acidosis. The results of the levels (ca) were significantly higher in the 75 mM group than in the control dogs. On the other hand, there were significant differences between the 75 mM and 150 Mm group. While the dogs exposed to a dose of 300 mM showed the highest increase among all groups.

Table: 5 ALT levels in experimental animals.

Groups	0 day	7 day	10 day	lsd
Control (normal saline)	35.3 ±0.153	37.8 ±0.184	36.7 ±0.144	
Treatment 1 (75 mM)	36.3 ±0.153	222 ±0.142	261 ±0.122	0.00 266
Treatment 2 (mM150	38.66 ±0.184	234 ±0.193	267 ±0.142	0.02 87
Treatment 3 (300 mM)	35.6 ±0.144	240 ±0.291	264 ±0.158	0.03 5
Lsd	0.062	0.087	0.066	

Table 5 indicates that ALT levels increased significantly in dogs induced with acidosis, especially after days 1 and 10, respectively. It was also noted that the enzyme levels increased progressively with rising HCL concentrations (75, 150 and 300 mM) in concentrations in the 75, 150, and 300 mM groups.

Table 6: AST levels in experimental animals.

Groups	0 day	7 day	10 day	lsd
Control (normal saline)	39 ±0.148	42 ±0.053	35 ±0.114	
Treatment 1 (75 mM)	40 ±0.148	105 ±0.118	206 ±0.418	0.0263
Treatment 2 (mM150	45 ±0.053	111 ±0.075	210 ±0.024	0.034
Treatment 3 (300 mM)	32.9 ±0.114	108 ±0.232	212 ±0.158	0.0293
Lsd	0.0241	0.021	0.051	

Table 6 indicates that AST levels increased significantly in dogs induced with acidosis, especially after days 1 and 10, respectively. It was also noted that the rates of increase

gradually increased in concentrations in the 75, 150, and 300 mM groups.

Table 7: creatinine levels in experimental animals.

Groups	0 day	7 day	10 day	lsd
Control (normal saline)	0.60 ±0.13	0.59 ±0.114	0.61 ±0.130	
Treatment 1 (75 mM)	0.58 ±0.13	0.62 ±0.11	0.66 ±0.083	0.0187
Treatment 2 (mM150	0.64 ±0.114	0.66 ±0.113	0.68 ±0.112	0.0192
Treatment 3 (300 mM)	0.64 ±0.130	0.68 ±0.164	0.69 ±0.114	
Lsd	0.023	0.011	0.043	

Table 7 indicates that creatinine levels increased significantly in dogs induced with acidosis, especially after days 1 and 10, respectively. It was also noted that the rates of increase gradually increased in concentrations in the 75, 150, and 300 mM groups.

Table 8: urea levels in experimental animals.

Groups	0 day	7 day	10 day	lsd
Control (normal saline)	20.34 ±0.158	19.77 ±0.158	21.43 ±0.321	
Treatment 1 (75 mM)	18.32 ±0.158	31.3 ±0.142	33.3 ±0.115	0.0318
Treatment 2 (mM150	21.32 ±0.158	33.3 ±0.132	35.3 ±0.116	0.0758
Treatment 3 (300 mM)	19.84 ±0.321	24.7 ±0.44	30.7 ±0.26	0.0297
Lsd	0.0121	0.0532	0.0143	

Table 8 indicates that urea levels increased significantly in dogs induced with acidosis, especially after days 1 and 10, respectively. It was also noted that the rates of increase gradually increased in concentrations in the 75, 150, and 300 mM groups.

In current study show, low paco2 due to metabolic acidosis which demonstrates the effectiveness of alveolar ventilation and this results approved with Verma and Roach **(8)**.The bicarbonate concentration may be used as a screening parameter of a non-respiratory acid-base disturbance, the present study elucidates significant decrease in HCO3, metabolic acidosis lead to this full and these findings agree with Naragatti **(9).**.In light of this research increase in Cl- levels is likely due to bicarbonate loss, consist with de Morais and Dibartolathe **(10).** In the metabolic acidosis the levels of Ca increased rapidly due to released from bones on other hands previous study revealed that Ca levels increased(**11**).Hepatocellular injury due to acidosis increased levels of ALT liver enzyme**(12).**Additionally an increase in the AST level liver enzyme point to hepatocellular necrosis (**13).**Creatinine levels increased due to Kidney dysfunction which may be exacerbated indirectly by acidosis **(14).**Similarly , elevated urea levels in this study support kidney impairment as reported by Kumar and Gill **(15).**

CONCLUSION

Through the current study conclude that as the dose of HCL injection increase in the experimental dogs the severty of metabolic acidosis become intense which leads to decrease in paco2 and hco3 and increase in electrolytes(ca,cl) and liver enzymes(AST,ALT) and kidney function test (creatinine,urea) . Therefore, this can affect the health of the dogs and its hemostasis of their body.

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