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CHANGES IN SOME SERUM ENZYMES AND UREA NITROGEN IN NEONATAL BOVINE DIARRHEIC CALVES OF DIFFERENT AGE GROUPS

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ABSTRACT

The present study was conducted on 100 cases of bovine calf diarrhea to monitor the activities of some serum enzymes *viz.*, AST, ALP, GGT, CK and urea nitrogen in neonatal calves of different age groups. These calves were divided into 5 age groups *viz.*, 1-7 day (7 calves), 8-14 days (5 calves), 15-21 days (30 calves), 22-30 days (19 calves) and 31-60 days (39 calves). The results of experimental groups were compared with normal standard values of different age groups. The diseased calves of all the age groups had significantly higher ($p<0.01$) serum AST activities as well as urea nitrogen as compared to control. Serum ALP activities were significantly low ($p<0.01$) in diseased calves of 8-14 days, 15-21 days and 31-60 days age groups. Alterations in other parameters were significant in specific age groups only.

Key words: Neonatal calf diarrhea, serum enzymes, urea nitrogen

INTRODUCTION

Neonatal calf diarrhea is one of the most devastating diseases of the dairy industry. Dehydration, electrolyte imbalance and acidosis are major systemic changes in diarrheic calves that often result in their death (El-Sheikh *et al*., 2004, Guzelbektes *et al*., 2007). The affected calves also show hemo-concentration with kidney and liver dysfunction (Maach *et al*., 1992). Different studies have reported biochemical alterations during neonatal calf diarrhea (Hussain *et al*., 2001, Seifi *et al*., 2006, El-Sheikh, 2011, El-Sheikh *et al*., 2012, Alam *et al*., 2012), however, the detailed information on these biochemical changes in different age groups of neonatal bovine diarrheic calves is not fully established. Present study, therefore, was an aimed to relate the biochemical changes in neonatal bovine calf diarrhea of different age groups.

MATERIALS AND METHODS

The present study was conducted on 100 cases of bovine calf diarrhea from 17 outbreaks reported in peri-urban dairy farms around Ludhiana (India). These calves were divided into five age groups *viz.*, 1-7 day age (7 calves), 8-14 days age (5 calves), 15-21 days age (30 calves), 22-30 days age (19 calves) and 31-60 days age (39 calves). Diagnosis of bovine calf diarrhea was made on the basis

of history and clinical examination of the sick animals. The diarrheic calves showed increased frequency of defecation with loose watery feces, tenesmus, soiling of tail and peri-anal area, dehydration and increased/sub-normal temperature. The results of experimental groups were compared with the normal standard values of different age groups. For estimating serum enzymes, blood was collected in gel vaccutainers without anticoagulant. The vaccutainers were kept undisturbed at an angle of 30°C, at room temperature for 30-60 min. and blood was allowed to clot. Serum was harvested by centrifugation at 3000 rpm for 15 min. and stored in multiple small aliquots of 1-2 mL each at -20°C until analysis.

Serum biochemical constituents were analyzed in Vet Scan VS2 Dedicated Veterinary Chemistry Analyzer (Abaxis, Inc. Union City, CA, USA), using single-use disposable large animal comprehensive diagnostic profile reagent rotors. The serum (100 µL) from each case was dispensed in rotors with the help automatic pipette and various enzymes *viz.*, aspartate aminotransferase (AST), alkaline phosphatase (ALP), γ-glutamyl transferase (GGT), creatine phosphokinase (CK) and serum urea nitrogen (SUN) were analyzed for each case. The data was tested for significance using ANOVA and t test. To compare different groups with different number of animals, analysis of variance and Turkey's HSD (Honestly significant differences) multiple comparisons test were used. All data was analyzed through SPSS version 17.0.

RESULTS AND DISCUSSION

All diarrheic calves had significantly higher ($p<0.01$) serum AST activities as compared to the normal values of respective age groups (Table 1), without any significant differences among different age groups of diseased calves. Hussain *et al.* (2001), Agrawal *et al.* (2002) and Pekcan *et al.* (2012) also observed increase in serum AST levels in one-week and day-old calves suffering from diarrhea. The increase in AST activity in diarrheic calves was suggestive of liver damage (Grodzki *et al.*, 2009) and is attributed to enterotoxaemia in infectious diarrhea (El-Sheikh, 1987).

There was a significant difference in serum ALP activity of diseased calves of different age groups (Table 1). Lowest values were seen in 8-14 days age group, while highest values were observed in 22-30 day calves. Comparison of diseased groups and normal standard values revealed that diseased calves of 8-14, 15-21 and 31-60 day age groups had significantly decreased ($p<0.01$) serum ALP activities (Table 1). The findings are in agreement with Hussain *et al.* (2001). Contrarily, Groutides and Michell (1990) and Lechowski (1996) observed an increase in serum ALP, whereas Alam *et al.* (2012) found no significant difference in serum ALP between diarrheic and healthy calves.

Table 1: The average values and ±SD of AST, ALP and GGT in diseased calves of different age groups suffering from diarrhea

Age group (days)	Diarrheic calves (No.)	AST (IU L^{-1})			ALP (IU L^{-1})			GGT (IU L^{-1})		
		Diseased group	Normal	t-value	Diseased group	Normal	t-value	Diseased group	Normal	t-value
1-7	7	80.0±7.63	31.97±4.16	5.23**	292±141	300±123	1.37	859±124	469±416	6.77
8-14	5	58.0±9.98	31.82±3.85	3.62**	87 ±20	300±123	4.56**	62±45	59±34	1.52
15-21	30	87.1±7.19	42.30±2.21	4.37**	180±153	295±137	3.98**	87±156	78±101	2.16*
22-30	19	76.4±3.97	38.00±4.98	5.18**	309±252	290±118	1.76	339±841	469±416	3.55**
31-60	39	73.1±8.53	46.61±2.12	3.51**	188±158	370±126	4.06**	105±248	92±167	1.67
F-ratio			0.62			2.72**			4.28	
Tukey's significance			ns			2/1,2/3,2/4,2/5,4/3,4/5			1/3, 1/4, 1/5	

*P<0.05 ** P<0.01

Table 2: The average values and statistical significances of CK and SUN in diseased calves of different age groups suffering from diarrhea

Age groups (days)	Diarrheic calves (No.)	CK (IU L^{-1})			SUN (mg dL^{-1})		
		Diseased Group	Normal	t-value	Diseased group	Normal	t-value
1 – 7	7	554.56 ± 154.75	421.43 ± 253.62	3.62**	13.33 ± 7.53	9.30 ± 1.21	3.43**
8 – 14	5	190.67 ± 112.26	178.34 ± 92.41	2.23*	14.00 ± 6.00	9.55 ± 1.70	5.28**
15 – 21	30	307.53 ± 247.31	267.53 ± 178.45	2.54*	18.37 ± 10.85	11.25 ± 0.80	5.84**
22 – 30	19	273.32 ± 179.83	284.40 ± 161.43	1.19	20.11 ± 23.49	12.75 ± 3.00	6.21**
31 – 60	39	222.31 ± 125.78	218.34 ± 121.65	0.84	20.11 ± 23.49	16.43 ± 3.45	4.31**
F-ratio			2.68**			0.43	
Tukey's significance			1/5			ns	

*P<0.05 ** P<0.01

Significant differences were observed in serum GGT activities of diseased calves of different age groups (Table 1) with highest activity in diseased calves of 1-7 days age. However, a sharp decline in GGT activity in the diseased calves of 8-14 and 15-21 day age groups were in agreement with the findings of Grodzki et *al.* (2009) and El-Sheikh (2011), who suggested that decrease in GGT activity may be due to diminished intestinal absorption of colostral fraction of GGT.

Lowest activity of CK was observed in diseased calves of 31-60 days age group, which was significantly different ($p<0.01$) from the highest CK activity of diseased calves at 1-7 days age. Comparison of diseased groups and normal values revealed that diseased calves of 1-7, 8-14 and 15-21 day age groups had significantly higher ($p<0.01$) serum CK activities (Table 2).

The diseased calves of all the age groups had significantly higher ($p<0.01$) SUN values as compared to the normal standard for the respective age groups (Table 2). This increase may be attributed to excessive loss of fluid from detached epithelial cells from the intestine of diarrheic calves thus leading to hemoconcentration and dehydration, decreasing blood supply to the vital organs and kidney. Our findings are in tune with Hussain *et al.* (2001), Agrawal *et al.* (2002) and Pekcan *et al.* (2012) in diarrheic calves of different age groups. Alam *et al.* (2012) observed that progressive dehydration in diarrhea-affected calves resulted in inadequate renal perfusion which might explain the increase in SUN levels (El-Sheikh, 1987).

Conclusion: The study revealed that diarrheic calves starting from one day-old to 60 days age had liver and kidney dysfunction as revealed by increased AST and BUN in all the categories of neonatal diarrheic calves.

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