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NOTE

Alterations in Serum Biochemical Parameters of Horses with Leptospirosis

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In this study, the alterations in serum biochemical parameters of horses with leptospirosis was investigated. For this aim, 8 h with leptospirosis, were determined by the microscopic agglutination test and 8 healthy horses were used as material. The levels of serum glucose, urea, creatinine, uric acid, total cholesterol, high-density lipoprotein (HDL), triglyceride, total protein, albumin, globulin, aspartate aminotransferase (AST), alkaline phosphatase (ALP), lactate dehydrogenase (LDH), creatinine kinase (CK), sodium, potassium, chloride, calcium, phosphorus, magnesium were evaluated in leptospirosis cases and healty horses. Although we found significant decreases in levels of glucose ($p < 0.01$), uric acid ($p < 0.01$), HDL cholesterol ($p < 0.05$), ALP ($p < 0.01$), Cl ($p < 0.01$), Ca ($p < 0.05$), P ($p < 0.001$) in horses with leptospirosis, level of urea ($p < 0.05$) in horses with leptosprosis showed significant increases. The results obtained may suggest that these parameters might have taken part in the diagnosis and treatment of horse leptospirosis.

Key Words: Horse, Leptospirosis, Biochemical parameters, Glucose.

Leptospirosis is a zoonotic acute bacterial disease with world-wide distribution. The disease is caused by various serovars of Leptospira spp. and is presumed to be the most widespread zoonosis[1]. The disease is sustained in nature by maintenance hosts namely infected animals. Human and animals may acquire disease by direct or indirect contact with materials contaminated with excretions of the infected animals such as urine and uterus discharge[2]. Following invasion of the organism the kidney and liver are the majör parenchymatous organs affected and cytotoxic factors take part. Renal colonization occurs as the organism replicates and persists in renal tubular epithelial cells resulting in varying degree of interstitial nephritis with inflammatory cells surrounding the tubules leading to renal failure[3]. Similarly, liver is also invaded by the bacteria resulting in liver disorganisation and hepotocyte apoptosis[4] and hepatic central-lobular necrosis[5].

Leptospirosis in horses is most commonly associated with uveitis (moon blindness) or abortions. The disease is typically seen as a self-limiting mild fever with anorexia, although in severe forms hemolysis and vasculitis can result in petechial hemorrhages on mucosal surfaces, hemoglobinuria, anemia, icterus, conjunctival suffusion, depression and weakness. Renal failure has been documented in foals[6,7]. Leptospirosis is a growing problem for horse owners because there's no vaccine specifically for horses. To prevent problems, horse owners are advised to keep an eye out for possible signs of leptospirosis and to take precautions to reduce the risks of infection[6]. Furthermore, there is a lack of studies regarding biochemical changes in horses with Leptospirosis, what can be useful to a better understanding of the possible signs and systemic effects of the infection. Pinna *et al.*[8] studied horses with Leptospirosisand especially concentrated on the parameters of the enzymes. However thereare apparently no reports regarding other biochemical parameters such as trygliceride, total protein, albumin, globulin, Na, K, Cl in horses with leptospirosis.

The study was performed in 8 horses suffering from leptospirosis which were detected by the microscobic agglutination test[9] and 8 clinically healthy horses. All animals were from Bursa region of Turkeyand were subjected to similar management conditions. Blood samples were collected from all animals *via* jugular vein into Vacutainer blood collection tubes and were transported on ice chest to the laboratory for analysis immediately. Sera were collected bycentrifugation at 3000 g for 10 min at room temperature. Serum glucose, urea, creatinine, uric acid, total cholesterol, HDL cholesterol, triglyceride, total protein, albumin, globulin, AST, ALP, LDH, CK, Na, K, Cl, Ca, P, Mg levels were measured using autoanalyzer (Helena Technicon RA-1000 TM System) andaccompanying kits.

Statistical analysis was performed using the SPSS 17.00 statistical program. Normal distribution of the data was determined using Anderson-Darling Normality test. Duncan-

ANOVA test was used to compare the parameters between the groups. For all parameters *p*-values < 0.05 were considered significant. Data are presented as means ± SD.

In the healty and leptospirosis groups, the averagelevels of serum glucose, urea, creatinine, uric acid, total cholesterol, HDL cholesterol, triglyceride, total protein, albumin, globulin, AST, ALP, LDH, CK, Na, K, Cl, Ca, P, Mg with thestatistical significance of standard deviations and the differencesbetween the groups, are given in Table-1. There was a statistically significant decrease in serum level of glucose ($p < 0.01$) in horses with leptospirosis according to thevalues of the healthy group. However glucose concentration is reported to increase in human leptospirosis with pancreatitis involvement[10] and cattle leptospirosis[11].

TABLE-1
CHANGES IN BIOCHEMICAL PARAMETERS IN HORSES WITH LEPTOSPIROSIS (n = 8) ($^{*}p < 0.05$) ($^{**}p < 0.01$)) ($^{***}p < 0.001$)

Biochemical parameters	Groups	
	Healthy $\bar{x}$ ± SD	Leptospirosis $\bar{x}$ ± SD
Glucose (mg/dl)	78.37 ± 7.45	51.62 ± 4.98**
Urea (mg/dl)	25.14 ± 1.86	33.00 ± 2.97*
Creatinine (mg/dl)	1.175 ± 0.04	1.125 ± 0.06
Uric acid (mg/dl)	0.33 ± 0.03	0.17 ± 0.025**
Total cholesterol (mg/dl)	103.87 ± 6.40	87.80 ± 6.00
HDL cholesterol (mg/dl)	61.75 ± 3.22	42.50 ± 6.88*
Triglyceride (mg/dl)	45.62 ± 3.93	33.00 ± 8.7
Total protein (g/dl)	6.21 ± 0.61	6.27 ± 0.14
Albumin (g/dl)	2.61 ± 0.15	2.65 ± 0.06
Globulin (g/dl)	3.6 ± 0.07	3.7 ± 0.13
AST (U/l)	210.12 ± 19.97	187.5 ± 42.74
ALP (U/l)	334.75 ± 42.61	193.75 ± 33.17**
LDH (U/l)	312.5 ± 30.6	230.37 ± 20.03
CK (U/l)	100.25 ± 11.01	88.86 ± 29.52
Na (mEq/l)	139 ± 0.63	132.75 ± 2.87
K (mEq/l)	3.92 ± 0.13	3.51 ± 0.19
Cl (mEq/l)	100.62 ± 1.16	92.5 ± 2.45**
Ca (mg/dl)	12.36 ± 0.28	10.96 ± 0.53*
P (mg/l)	4.4 ± 0.38	2.21 ± 0.20***
Mg (mg/dl)	1.93 ± 0.06	1.76 ± 0.05

On the contrary, the levelof urea in horses with leptospirosis were found to be increased significantly when compared with the healthy group ($p < 0.05$) (Table-1). Begenik *et al.*[12] also found high ure level in human leptospirosis. The serum uric acid level (0.17 ± 0.025 mg/dl) in horses with leptospirosis was approximately 2-times lower than the levelof healthy horses (0.33 ± 0.03 mg/dl) ($p < 0.01$). We also found a significant decrease in the level of HDL cholesterol in horses with leptospirosis when compared with the healthy group ($p < 0.05$) (Table-1). Similarly Gazi *et al.*[13] conclude that leptospirosis lowers serum HDL cholesterol level in human and this effect may be mediated by TNFα and IL-1β. The level of ALP significantly decreasedin horses with leptospirosis when compared with the healthy group ($p < 0.01$). We determined a significant decrease in serum Cl ($p < 0.01$), Ca ($p < 0.05$) levels in the horses with leptospirosis when compared with the healthy group (Table-1). Zaragoza *et al.*[14] found normal level of calcium incanine leptospirosis. The averageserum concentrations of P in horses with leptospirosis were about 2-fold lower than in the healthy group ($p < 0.01$) (Table-1) consistent with those of Zaragoza *et al.*[14] in canine leptospirosis.

There were no significant differences regarding creatinine, total cholesterol, triglyceride, total protein, albumin, globulin, AST, LDH, CK, Na, K, Mg between two groups (Table-1). Pinna *et al.*[8] reported that creatinin level increased from 0.67 mg/dl-1.1 mg/dl to 1.2 mg/dl ($p < 0.05$), AST level decreased from 303 U/l-336 U/l to 317 U/l and LDH level changed from 629 U/l -770 U/l to 763 U/l and ALP level increased from 245 U/l -321 U/l to 350 U/l in horses with leptospirosis. In the present study serum AST, LDH, ALP levels in horses with leptospirosis were lower than that shown by Pinna *et al.*[8]. Serum creatinin level were almost the same with reported by Pinna *et al.*[8] (1.2 mg/dl) (Table-1). Zaragoza *et al.*[14] reported that four of the 10 dogs with leptospirosis showed decreased concentrations of serum albumin and three of which showed increasedconcentrations of cholesterol. Begenik *et al.*[12] reported that decreased levels of Na and K and increased level of CK in human leptospirosis.

Conclusion

Leptospirosis is an important infectious disease characterized mainly by trigger fever, uveitis, abortions and even death in horses. Consistent with this several serum biochemical parameters also changes during the disease and these parameters useful for diagnosis of leptospirosis. In this study we determined significant decreases in levels of glucose, uric acid, HDL cholesterol, ALP, Cl, Ca,P and increase level of ureain horses with leptosprosis.

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REFERENCES

1. World Health Organization (WHO), Leptospirosis Worldwide, Weekly Epidemiological Record, pp. 74/237-74/242 (1999).
2. O.M. Radostits, D.C. Blood and C.C. Gay, Veterinary Medicine: A Textbook of the Diseases of Cattle, Horses, Sheep, Pigs and Goats, Baillaire Tindall, London, UK, edn. 8, pp. 884-908 (1994).
3. J.C. Thompson and B.W. Manktelow, *J. Comp. Pathol*., **101**, 201 (1989).
4. R. Plank and D. Dean, *Microbes Infect*., **2**, 1265 (2000).
5. A.V. Lomar, D. Diament and J.R. Torres, *Infect. Dis. Clin. North Am*., **14**, 23 (2000).
6. A.W. Kitson-Piggot and J.F. Prescott, *Can. J. Vet. Res*., **51**, 448 (1987).
7. P. Vijayachari, A.P. Sugunan and A.N. Shriram, *J. Biosci*., **33**, 557 (2008).
8. M. Pinna, G. Martins, I. Freire and W. Lilenbaum, *Cienc. Rural*., **40**, 2214 (2010).
9. S. Faine, World Health Organization (WHO), Guidelines for Control of Leptospirosis, Section B-38, Geneva (1982).
10. E.F. Daher, D.M. Brunetta, G.B. Silva Junior, R.A. Puster, R.M.S.V. Patrocinio, *Revista do Instituto de Medicina Tropical de Sao Paulo*, **45**, 307 (2003).
11. H.M. Erdogan, M. Karapehlivan, M. Citil, O. Atakisi, E. Uzlu, A. Unver, *Vet Res Commun*., **32**, 333 (2008).
12. H. Begenik, Y.U. Soyoral, A.I. Baran, M.K. Karahocagil and R. Erkoç, *Van Tip Dergisi*, **18**, 33 (2011).
13. I.F. Gazi, F.A. Apostolou, E.N. Liberopoulos, T.D. Filippatos, C.C. Tellis, M.S. Elisaf and A.D. Tselepis, *Lipids*, **46**, 953 (2011).
14. C. Zaragoza, R. Barrera, F. Centeno, J.A. Tapia and M.C. Mane, *J. Comp. Pathol*., **129**, 169 (2003).