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Liver function test profile in lantana-induced hepatitis in buffalo calves (*Bubalus bubalis*)

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Disturbances in liver function are fairly common in cattle and buffaloes and a variety of tests of liver functions help to diagnose hepato-biliary disorders (Kaneko 1986). The present study was undertaken to evaluate the comparative sensitivity of various liver function tests against lantana-induced hepatitis in buffalo calves.

Hepatitis was induced in 6 male healthy buffalo calves aged between 9 and 12 months, by oral administration of a single dose of dried leaf powder of *Lantana camara* variety *aculeata-red flower* containing lantadene A and B, each @ 10 mg/g and reduced lantadene A @ 6 g/kg of body weight. Other 6 calves were kept as healthy control. Blood samples were collected at various intervals (Table 1) and were analysed for the plasma activity of γ glutamyl transpeptidase (γ-Gt) alkaline phosphatase (AKP), aspartate amino-transferase (AST) and alkanine amino-transferase (ALT) using chemistry analyser through standard kits. Plasma arginase activity (Mia and Koger 1978), bromo-sulphalein (BSP $t_{½}$) value (Kaneko 1980) and total and differential plasma bilirubin (diagnostic reagent kits by spectrophotometer) were estimated. Histopathological examination of liver of dead animals was done by using standard haematoxylin and eosin staining tech-

Table 1. Liver function tests in lantana-induced hepatitis

Parameters	Mean±SE values at different observation period (hr)						
	0	6	12	24	48	72	96 or before death
λ-GT	3.17±0.94	8.83*±1.06	22.0**±1.33	41.17**±1.96	55.33**±2.18	63.50**±2.35	69.33**±2.38
(IU/L)	(6.17±0.94)	(3.83±0.17)	(4.17±0.60)	(3.50±0.43)	(5.00±0.73)	(4.5±0.62)	(4.83±0.42)
AKP	149.17±9.06	198.5*13.16	336.83**±41.21	511.33**±62.85	781.67**±75.84	1045.33**±91.15	1193.83**±103.2
(IU/L)	(158.5±9.67)	(148.33±8.26)	(150.17±9.58)	(166.5±14.34)	(162.17±11.46)	(142.33±8.06)	(152.17±11.36)
Arginase	3.23±1.53	4.41±1.85	11.92**±3.52	23.66**±6.41	78.83**±14.72	126.27**±15.46	161.54**±22.53
(IU/L)	(4.41±0.98)	(5.12±1.08)	(3.87±0.93)	(4.38±0.97)	(3.48±0.88)	(2.98±0.76)	(3.17±0.74)
ALT	17.33±1.45	22.77*±1.64	26.67*±2.09	21.33±1.89	24.67*±2.01	25.83*±2.18	27.67**±2.41
(IU/L)	(19.17±1.16)	(16.17±1.02)	(46.17±12.42)	(56.5±13.57)	(46.67±12.88)	(61.5±51.09)	(52.33±9.21)
Total bilirubin	0.23±0.05	0.65*±0.15	1.53**±0.32	2.62**±0.29	4.7**±0.41	6.94**±0.65	8.08**±0.92
(mg/dl)	(0.21±0.03)	(0.26±0.05)	(0.24±0.03)	(0.26±0.06)	(0.22±0.03)	(0.28±.07)	(0.23±0.06)
Direct bilirubin	0.10±0.02	0.42*±0.14	0.81**±0.17	1.35**±0.25	2.93**±0.38	4.52**±9.46	4.86**±0.38
(mg/dl)	(0.07±0.01)	(0.11±0.03)	(0.09±0.02)	(0.12±0.03)	(0.10±0.01)	(0.09±0.02)	(0.10±0.02)
Indirect bilirubin	0.13±0.05	0.23±0.06	0.72*±0.24	1.27**±0.19	1.77**±0.24	2.42**±0.26	3.22**±0.52
(mg/dl)	(0.14±0.03)	(0.15±0.03)	(0.15±0.04)	(0.14±0.03)	(0.12±0.02)	(0.19±0.06)	(0.13±0.04)
BSP $t_{½}$	4.18±0.73		6.53**±0.83	14.10**±2.12	23.59**±4.32		38.17**±7.1
(min)	(3.65±0.31)		(3.08±0.28)	(4.17±0.30)	(4.38±0.35)		(3.17±0.27)

Figures in parentheses = control group, *significant at 5% level (P<0.05); **significant at 1% level (P<0.01).

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nique. Statistical analysis (paired t-test) was done by the method of Snedecor and Cochran (1967).

The progressive and significant ($P<0.01$) increase in the mean values of plasma γ-GT and AKP activity and those of arginase AST and ALT (Table 1) was suggestive of severe chloestasis and degenerative changes in the liver of the buffalo calves (Kaneko 1989), which were confirmed during histopathological examination of the liver of the same animals after their death. The above enzymatic alteration simulated the findings of Sharma *et al.* (1991), Mckenzie (1991) and Bahadur *et al.* (1992). However, in the present investigation, the increase in γ-GT activity was 2.79-fold compared to 1.33-fold increase in the activity of AKP, at 6 hr post-induction of hepatitis, indicating that γ-GT is a more sensitive indicator of hepatic cholestasis. The increase in arginase activity was significant ($P<0.05$), viz. 3.69-fold as against the non-significant ($P<0.01$) increase (1.54- and 1.54-fold) in the respective activity of ALT and AST, at 12 hr after induction of hepatitis. This indicated that arginase was the most sensitive diagnostic marker of hepatic degenerations amongst the above enzymes.

Similarly significantly ($P<0.05$) elevated level of direct plasma bilirubin (4.2-fold) compared to 1.77-fold increase in indirect bilirubin at 6 hr (Table 1) was suggestive of obstructive jaundice. The present observation simulated the findings of Aguilera *et al.* (1986) and Obwold *et al.* (1991). The BSP $t_{½}$ value increased 1.56-fold at 12 hr of induction of hepatitis (Table 1), indicating hepatic excretory activity, bilirubin (total and differential) concentration and BSP $t_{½}$ value remained within normal range throughout the period of experiment in control group.

It was inferred that plasma γ-GT and arginase activity along with plasma bilirubin (total and differential) concentration and BSP $t_{½}$ value are the sensitive diagnostic indicators of lantana induced hepatitis in buffalo calves.

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