Lipid metabolic changes in experimentally induced leptospiral infection with serovars australis, canicola and icterohaemorrhagiae

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Changes in lipid fractions were evaluated in young guinea pigs when infected with 1ml of 7 day old live cultures of leptospira interrogans serovars australis, canicola and icterohaemorrhagiae. Statistically significant elevation in triglycerides, very low density lipoprotein and phospholipid and a significant reduction in high density lipoprotein (HDL) in all the groups was observed. Cholesterol and low density lipoprotein showed ascending trend in icterohaemorrhagiae group, whereas they were normal in other groups. The results suggest that increase in triglycerides, phospholipid and decrease in HDL in a suspected case of leptospirosis may be considered as markers.

The lipid requirement of leptospires had attracted the attention of several investigators1. Vogel and Hutner found that various esterified fatty acids promoted the growth of several strains of leptospires in a chemically defined medium2. Johnson and Gary observed that leptospires have higher affinity towards long chain fatty acids in invitro culture3. Detection in the alterations of some biochemical parameters may also help in the diagnosis of leptospirosis. There is paucity of information regarding lipid changes in various strains of leptospiral infection. Hence, it was proposed to undertake a comparative study of lipid changes in experimentally inoculated guinea pigs with the virulent serovars australis, canicola and icterohaemorrhagiae.

Young (2 months old) guinea pigs (24), weighing of 100-150 g, were used. The animals were supplied by the Animal Experimental Laboratory, Madras Medical College, Chennai and were fed with standard laboratory diet. Microagglutination test (MAT)4, confirmed that the animals were free from leptospiral antibody. The guinea pigs were divided into 4 groups of 6 animals each. Rats in the first group formed the control and were injected with 1ml saline. Rats from groups II, III and IV were inoculated ip5 with 1ml of 7 days old live cultures of pathogenic leptospires of serovars australis, canicola and icterohaemorrhagiae, respectively. These serovars were obtained from Leptospira Reference Laboratory, Amsterdam, Netherlands. The cultures were grown in EMJH medium5. Blood samples were collected from all the groups of animals by cardiac puncture at the end of 7th, 14th, 21st and 28th day post-inoculation. Biochemical parameters like cholesterol (TC)6, triglycerides (TGL)7, High density lipoprotein (HDL), Low density lipoprotein (LDL), Very low density lipoprotein (VLDL)7 and phospholipids (PL)8 were determined in these blood samples. The results were compared against the control values and analysed statistically using Student’s t test. The specific antibody titres were assessed by MAT4 in all the groups.

The results are presented in Fig. 1(a-c).

Alterations in blood lipid composition occurred in the experimental leptospirosis in the form of elevated TGL, VLDL and phospholipid and a reduction in HDL [Fig 1 (a-c)]. The changes observed in these groups of animals resemble with the autumnalis infected animals9. Frederickson et al10 stated that the elevation in serum TGL cannot be explained by the increase in absorption of dietary fat because there were no increase in chylomicrons. Hence it is likely that the increase in TGL is either associated with increased production by the liver or decreased peripheral utilisation. The increase in phospholipid could be due to the deficiency of phospholipase enzyme caused by some toxic action. Alternatively it may be due to an increased membrane permeability which may bring about increased release of phospholipids into the circulation11. It has been observed that the HDL concentration in the plasma vary inversely with plasma TGL concentration. HDL
in hypertriglyceridemia with or without hypercholesterolemia will be predictably low\textsuperscript{14-16}. These findings correlate well with the present data. Myocardial involvement is most commonly encountered with leptospiral infections which may also account for the lowered HDL\textsuperscript{17}.

The results obtained with \textit{icterohaemorrhagiae} infection (Fig.1c) showed much higher values when compared to the other serovars. (Fig. 1a and b). \textit{Icterohaemorrhagiae} is comparatively a sturdy and more virulent form of leptospire. Sorgdrager\textsuperscript{17} pointed out that the disease in guinea pigs due to serovar \textit{canicola} was much milder when compared with \textit{icterohaemorrhagiae}. The above mentioned serovars of leptospires could produce varying intensity of infection in guinea pigs. Due to the different antigenic potency the MAT titre may vary. This has been observed in guinea pigs when inoculated with

Fig. 1—Levels of lipids in guinea pigs inoculated with (a) \textit{australis}, (b) \textit{canicola}, and (c) \textit{icterohaemorrhagiae} serovars (values are mean ± SE)
australis, the MAT antibody titres were ranging from I:40 to I:320, with canicola from I:80 to I:320 and with icterohaemorrhagiae from I:80 to I:640. There was no association between MAT antibody levels among the 3 serovars of leptospires.

Summing up, the present study on the evaluation of certain lipid parameters in experimental leptospirosis, shows that increase in TGL and phospholipid and decline in HDL during febrile stage of a jaundice or uraemic patient suspected of leptospirosis can be considered as a marker. The findings can further enhance the clinician’s diagnosis in treating the above patients by extrapolating these results.

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