

HEPATOPROTECTIVE ACTIVITY OF SUPERLIV LIQUID IN CCL₄ INDUCED FLKS SYNDROME IN COMMERCIAL BROILERS

P. M. Sonkusale, A. R. Sawarkar and P. D. Jumde

Nagpur Veterinary College

Maharashtra Animal & Fishery Sciences University

Nagpur, India

Received 18-12-2015 Accepted 12-2-2015

Corresponding Author : drprashantvet@yahoo.com

ABSTRACT

A total of 75 day old broiler chicks were divided into three equal groups. Group A served as negative control. Group B (positive control) and C (treatment group) were intoxicated with CCl₄ orally @ 1 ml/kg body weight after every 3rd day during 15-28 days of age. Treatment group C was given superliv liquid @ 10 ml/100 chicks / day in drinking water during 29th-42nd day of age. At the end of experiment, significantly (P<0.01) higher mean body weight and lower FCR was observed in treatment group C as compared to positive control group B. Similarly, significantly decreased levels of SGOT, SGPT, cholesterol, triglycerides, VLDL, creatinine and higher mean values of serum protein profile along with mild degenerative changes in liver and kidney of broiler from group C were observed as compared to group B indicating efficacy of superliv in ameliorating the toxic effects or FLKS induced by CCL₄ in commercial broilers.

KEY WORDS: CCL₄ Toxicity, Superliv, Hepato-protective, Broilers

INTRODUCTION

Liver actively involved in many metabolic functions and is the frequent target for a number of toxicants (Meyer and Kulkarni, 2001). Fatty Liver and Kidney Syndrome (FLKS) is a metabolic disease in poultry that may occur either due to metabolic or nutritional disturbances or chemical intoxication which is characterized by disproportionate infiltration of lipid in the liver and kidney, enlarged friable liver, hyper-cholesterolemia, decreased performance and poor egg production in poultry (Simpson and Harms, 1983). It is well established that carbon tetrachloride (CCl₄) induces hepatotoxicity by metabolic activation resulting into hepatic steatosis, centrilobular necrosis and ultimately cirrhosis and acute tubular necrosis (Karmia, 2007). Hepato-protection by conventional or synthetic drugs used in the treatment of liver diseases are inadequate and sometimes may have serious side effects (Guntupalli *et al.*, 2006). There are a number of medicinal preparations in Ayurveda recommended for the treatment of liver disorders (Chatterjee, 2000). The present investigation was undertaken to assess the hepato-protective activity of superliv liquid, poly-herbal formulations (supplied by M/S Ayurved Limited, Baddi, India) in CCl₄ induced FLKS in commercial broilers.

MATERIALS AND METHODS

Total of 75 day old commercial broiler chicks (Cobb) were randomly divided into three groups each comprising 25 chicks. Group A served as negative control, group B served as positive control and group C as treatment group. Group B and C were induced with FLKS by giving CCL₄ @ 1ml/kg body weight orally at every 3rd day during 15-28 day of age. The treatment group C was given Superliv liq. @ 10 ml/100 chicks in drinking water from 28 to 42 day of age. All the birds were vaccinated as per routine farm practices. All the groups were offered similar commercial broiler feed throughout the experimental period without any additional supplementation of choline and biotin in order to induce hepatic syndrome. Growth parameters which included weekly average body

weight, feed consumption and feed conversion ratio (FCR) was recorded during complete experiment. The blood samples were collected from 10 birds per group on 28th and 42nd day of experiment to evaluate biochemical parameters by using analytical kits of RFCL Ltd. on clinical chemistry semi auto analyser. For gross pathological study, the 5 birds from each group were slaughtered and tissue samples of liver and kidneys were collected in 10% formal saline and processed for histopathological examination (Luna, 1968). All the parameters were statistically analyzed as per the method given by Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

Growth performance: The observations of weekly average body weight and FCR in various treatment groups is presented in Table 1 and 2 respectively. Final mean body weight of therapeutically treated birds with superliv (Group C) was significantly ($P < 0.01$) higher than the fatty liver induced positive control group B. Similarly, mean values of FCR in therapeutic treated group C was lower than positive control group B indicating efficacy of superliv in improving gut function, metabolism, nutrient assimilation and utilization. Similar findings have been reported by Singh *et al.* (2002) in broilers.

Table 1. Weekly average body weight (gm) of broilers from various treatment groups

	0 day	1 st wk	2 nd wk	3 rd wk	4 th wk	5 th wk	6 th wk
Group A	41.80	137.68	353.28	640.04 ^a	941.56 ^a	1379.25 ^b	1819.75 ^b
Group B	42.00	140.40	353.24	625.08 ^b	904.76 ^b	1351.95 ^c	1760.50 ^c
Group C	41.00	141.76	351.68	628.36 ^b	917.72 ^b	1410.20 ^a	1860.00 ^a

Mean with different superscripts in a column differ significantly ($P < 0.01$)

Table 2. Weekly Feed Conversion Ratio (FCR) of the birds during experiment

	Group A	Group B	Group C
1st week	1.12	1.13	1.12
2nd week	1.30	1.32	1.31
3rd week	1.45	1.54	1.53
4th week	1.67	1.69	1.71
5th week	1.80	1.82	1.79
6th week	2.08	2.10	1.95

Biochemical parameters: Average serum biochemical values of experimental broilers observed at 28th and 42nd day of age are presented in Table 3. The SGOT and SGPT levels were found to be elevated significantly ($P < 0.05$) in CCL₄ intoxicated group B as compared to control group A in both the intervals of experiment. Similar findings are reported earlier in rats during CCl₄ intoxication (Dahiru *et al.* 2005; Kanter *et al.* 2005). However, the values of these enzymes were recorded to normal level in therapeutic group C treated with superliv and found well comparable to that of the healthy control group A at the end of experiment which indicates the efficacy of ingredients of superliv viz. *Boerhavia diffusa* and *Andrographis paniculata* that are scientifically well proven to reduce liver marker enzymes (Jadhav *et al.* 2009). Significant ($P < 0.01$) decrease in the serum protein and globulin levels were noticed in CCL₄ intoxicated birds of group B and C on 28th day of experiment when compared with negative healthy control group A. Samudram *et al.* (2008) also reported significant ($P < 0.05$) decrease in serum proteins in CCl₄ induced hepatic damage in rats. The values of these parameters were recorded to get normalized in therapeutic treated group C and found well comparable to healthy control group on 42nd day. Similar findings are also reported in broilers intoxicated with CCL₄ and supplemented with Repchol (Jadhav *et al.* 2009).

Table 3. Biochemical parameters of serum collected from broilers on 28th and 42nd day of experiment

Parameters	On 28 th day of age			On 42 nd day of age		
	Group A	Group B	Group C	Group A	Group B	Group C
SGOT (IU/L)	268.38 ^b	290.79 ^a	286.86 ^a	261.91 ^a	286.47 ^b	251.83 ^a
SGPT (IU/L)	20.16 ^b	34.35 ^a	35.36 ^a	19.16 ^a	29.60 ^b	14.49 ^a
T Protein (g/dl)	4.67 ^a	4.20 ^b	4.15 ^b	4.21	4.11	4.18
Albumin (g/dl)	1.63	1.57	1.48	1.11	1.10	1.12
Globulin (g/dl)	3.04 ^a	2.66 ^b	2.66 ^b	3.09	3.00	3.06
Glucose (Plasma)	166.20	156.05	154.43	172.57	171.07	175.08
T Cholesterol (mg/dl)	118.31 ^b	138.28 ^a	135.60 ^a	123.86 ^b	137.30 ^a	118.12 ^b
Triglycerides (mg/dl)	65.59 ^b	74.78 ^a	72.30 ^a	73.42 ^b	89.73 ^a	70.22 ^b
HDL (mg/dl)	74.25 ^b	89.52 ^a	87.29 ^a	71.52	73.16	68.11
VLDL (mg/dl)	13.11 ^b	14.95 ^a	14.46 ^a	15.082 ^a	21.19 ^a	13.04 ^b
LDL (mg/dl)	30.93	33.80	33.84	37.26	38.19	33.97
Creatinine (mg/dl)	0.78	0.86	0.85	0.89	0.98	0.82

Mean with different superscripts in a row differ significantly (P < 0.05)

The mean values of serum cholesterol, triglycerides and VLDL were found to be significantly (P<0.05) increased in CCl₄ intoxicated group B when compared with the negative control group A on 42nd day of experiment. However, in therapeutic treated group C, these values were found well comparable to healthy control group A and significantly (P<0.05) lower than group B on 42nd day which may be attributed due to individual herbs of superliv liquid namely *Phyllanthus emblica*, *Picrorrhiza kurroa* that are scientifically well established to possess hypocholesterolemic activity (Khanna *et al.* 1994). Serum creatinine levels were higher in CCl₄ intoxicated group B, while values were found to be normalized in group C on 42nd day which received superliv herbal formulation. Thus serum biochemical profile indicates the efficacy of superliv containing herbs in ameliorating CCl₄ induced liver and kidney damage.

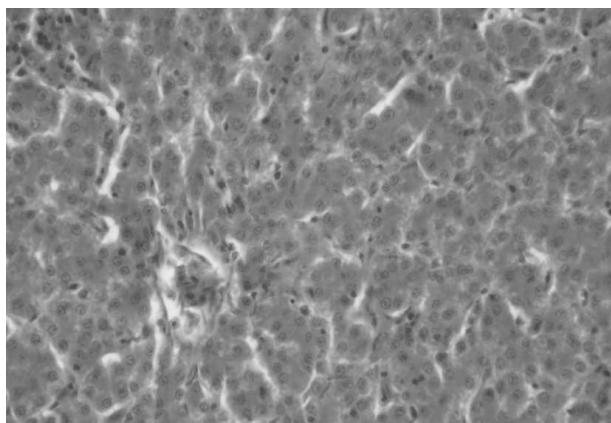


Fig.1 Group B - Liver showing necrotic areas and severe granular degenerative changes resulting decrease in sinusoidal space on 42nd day of experiment (H& E 400x)

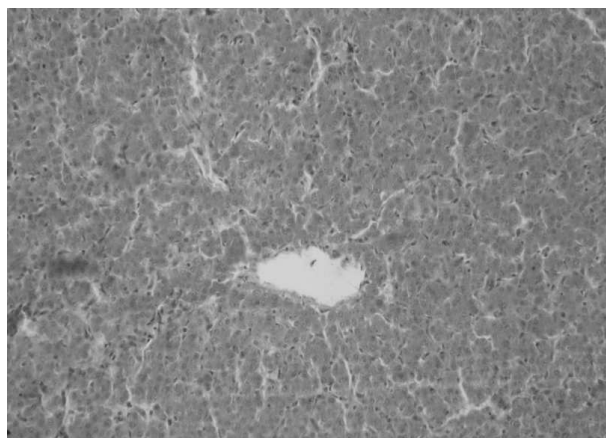


Fig. 2 Group C- Liver showed only mild degenerative changes on 42nd day of experiment (H& E 100x)

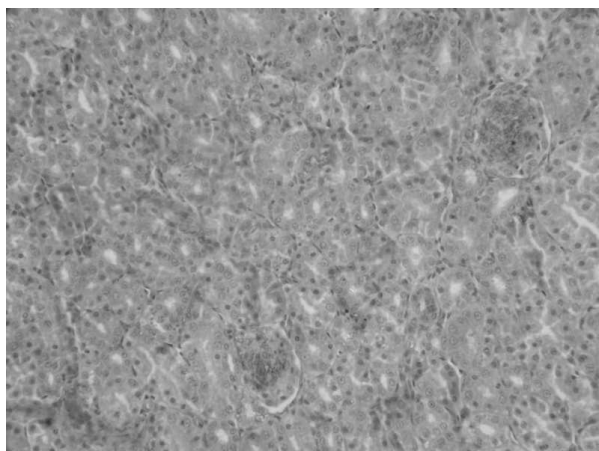


Fig. 3. Group B - Kidney showing adhesions of glomerular tuft to bowmen's capsule, tubular degeneration & haemorrhages on 42nd day of experiment. (H& E 200x)

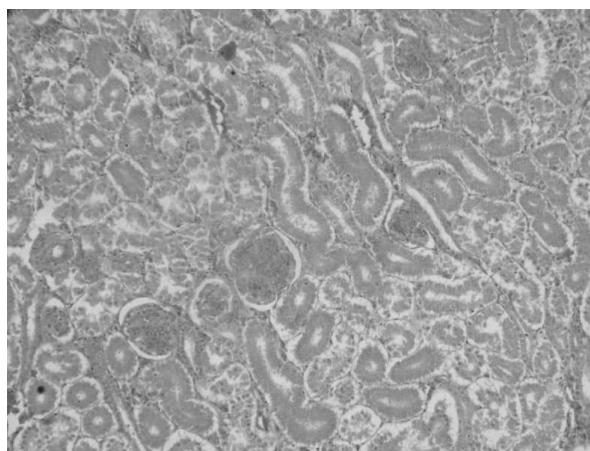


Fig. 4. Group C- Kidney showing mild degenerative changes on 42nd day of experiment (H& E 200x)

Gross and histopathological observations: Severe congestion in liver and kidney along with pale areas in liver was evident in CCL₄ intoxicated group B on 28th and 42nd day of experiment. Liver from group C returned to normalcy and kidney showed only mild congestion at the end of experiment. On histopathological examination, liver from positive control group B showed severe granular and vacuolar degenerative changes along with focal necrotic areas (Photo 1). However, only mild degenerative changes were observed in therapeutic group C on 42nd day of experiment (Photo 2). Adhesions of glomerular tuft to bowmen's capsule, interstitial hemorrhage and vacuolar degenerative changes were evident in kidney from group B (Photo 3). While in group C, only mild degenerative changes were observed at the end of experiment (Photo 4). Similar lesions were also reported earlier during CCL₄ intoxication in mice (Girish *et al.* 2009).

Findings of growth performance, biochemical estimates, gross and histopathological lesions indicates that superliv polyherbal liver tonic is efficacious in ameliorating the toxic effect or FLKS induced by CCl₄ in broilers indicating hepato-protective, hepato-stimulant and nephro-protective in nature.

ACKNOWLEDGEMENT

Authors are thankful to Ayurvet Limited, Baddi for providing samples and financial assistance to conduct research experiment.

REFERENCES

- Chatterjee, T.K. (2000). Medicinal plants with hepato-protective properties. In: Herbal options. 3rd Edn. Calcutta Books and Allied (P) Ltd. 135.
- Dahiru, D., William, E.T. and Nadro, M.S. (2005). *African J. Biotechnol.* **4**: 1177-1179.
- Girish, C., Koner, B.C., Jayathi, S., Rao, K.R., Rajesh, B. and Pradhan, S.C. (2009).. *Indian J. Exp. Biol.* **47**: 257-263.
- Guntupalli, M., Chandana, V., Palpu, P. and Shirwaikar, A. (2006). *J. Ethnopharmacol.* **103**: 484-490
- Jadhav, N.V., Maini, S. and Ravikanth, K. (2009). *J. Vet. Med* **5**: Online.
- Kanter, M., Coskun, O. and Budancamanak, M. (2005).. *World J. Gastroenterol.* **11**: 6684-6688.

Karmia, M.M. (2007). *World J. Zool.* **2**: 19-28.

Khanna, A.K., Chander,R., Kapoor, N.K. and Dhawan, B.N. (1994).. *Phytother Res.* **8**: 403-407.

Luna, A.G. (1968). Manual of histological staining methods of Armed Forced Institute of Pathology, 3rd Edition, Mc Graw Hill Book Co., London, 124-125

Meyer, S.A. and Kulkarni, A.P. (2001). Hepato-toxicity. In:Introduction to biochemical toxicology. 3rd Edn., New York. John Wiley and Sons. 487.

Samudram, P., Rajeshwari, H., Vasuki, R., Geetha, A. and Sathiya, P. (2008).. *African J. Biochem.* **2**: 61-65

Simpson, C.F. and Harms, R.H. (1983). *Avian Dis.* **27**:652-659.

Singh, K., Singh, N.S., Verma, D.N. and Singh, D.S. (2002).. *Ind. Vet. Med. J.***26**: 65-66.

Snedecor, G.W. and Cochran, W.S. (1994). Statistical Methods. 8th Edition. Oxford and IBH Publishing.

□