

# The Comparative effects of synthetic choline and herbal choline on hepatic lipid metabolism in broilers

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## Abstract

An experiment of 0-42 days in day old 150 Vencobb broiler chickens was conducted to determine comparative effects of synthetic choline and herbal sources of choline on hepatic lipid metabolism in broilers. Birds were randomly distributed into three groups (T<sub>0</sub>- T<sub>2</sub>), one untreated control and two treatments. Chicks in Group T<sub>0</sub> were given feed without any additional source choline chloride. Chicks of Group T<sub>1</sub> were fed with feed mixed with herbal product (Repchol supplied by Ayurved Ltd., Baddi, India) @ 500gm/tonne of feed and T<sub>2</sub> was given combination of synthetic choline chloride@1kg/tonne (60%) and biotin @ 150 mg/ton of feed. To study the effect of inclusion of herbal sources of choline and synthetic choline on hepatic lipid metabolism, serum triglycerides and cholesterol were estimated on day 21st and 42nd of experimental study. Gross pathological changes in liver were recorded on representative birds per group at the end of the study. It was recorded that inclusion of either synthetic choline or herbal source of choline exerted a hypocholesterolemic effect and also decreased the level of triglycerides as compared to untreated control thus minimizing the incidence of fatty liver, however the two treatment do not differ significantly. Gross pathological study also revealed no significant changes in the architecture of liver as compared to control. It can be concluded that the herbal supplements can successfully replace their synthetic analogues from broiler ration.

**Key words:** Broiler chickens, Hepatic, Synthetic choline, Herbal, Lipid Metabolism.

## Introduction

Choline is a rediscovered critical amino acid for poultry. Supplementation of choline in poultry ration is well established to improve growth, performance & to regulate lipid metabolism (Attia et al., 2005). Research studies indicate that supplementation of choline in ration is essential to prevent fatty liver syndrome by regulating lipid metabolism (Schrama & Gratis, 2000). Choline and SAME are an important nutrient in fatty liver disease. Deficiencies of any of the active coenzyme forms of vitamins choline, vitamin B group and folic acid will disrupt SAME production. SAME production decreases with age so dietary supplementation may be required for aged birds prone to fatty liver disease. Rats fed a ration providing adequate amounts of protein, fats, carbohydrates and vitamins, a large amounts of fat rapidly accumulated in the livers if the diet did not contain appreciable amounts of choline, or substances having similar effect on liver fat (Best et al., 1935). Though addition of choline in ration is important, but it is associated with

many residues also. Constant efforts to regulate synthetic vitamins and enzymes supplements are being made under organic poultry production programme all around the world so as to minimize the deleterious effects upon excessive & indiscriminate usage (Workel et al., 1999). This experimental study is designed with an aim to evaluate The Comparative effects of synthetic choline and herbal sources of choline on hepatic lipid metabolism in broilers.

## Materials and Methods

The experimental study was conducted on one hundred and fifty day old broiler chicks (Vencobb) at the poultry farm, College of Veterinary and Animal Sci., Udgir, Maharashtra, India.

**Experimental birds and management:** The vaccinated chicks were randomly divided into three groups with one control (T<sub>0</sub>) and two treatments (T<sub>1</sub> and T<sub>2</sub>) having 50 birds in each group with 4 replicates. Chicks in Group-T<sub>0</sub> were offered basal broiler starter and grower feed (as per NRC requirements) without

**Table 1: Mean ( $\pm$ SE) values of Serum Cholesterol (gm/dl) in different groups at 21<sup>st</sup> and 42<sup>nd</sup> day of study**

Groups	Day 21st	Day 42nd
T0	126.70 <sup>a</sup> $\pm$ 4.51	141.70 <sup>a</sup> $\pm$ 4.62
T1	119.50 <sup>b</sup> $\pm$ 2.55	120.50 <sup>b</sup> $\pm$ 4.1
T2	106.70 <sup>b</sup> $\pm$ 2.18	115.90 <sup>b</sup> $\pm$ 2.63

**Table 2: Mean ( $\pm$  SE) values of Serum triglyceride (mg/dl) in different groups at 21<sup>st</sup> and 42<sup>nd</sup> day of study**

Groups	Day 21st	Day 42nd
T0	146.40 <sup>a</sup> $\pm$ 9.82	116.0 <sup>a</sup> $\pm$ 29.51
T1	107.40 <sup>b</sup> $\pm$ 17.70	97.30 <sup>b</sup> $\pm$ 14.52
T2	89.40 <sup>b</sup> $\pm$ 4.03	70.90 <sup>b</sup> $\pm$ 5.95

Means with different superscripts differ significantly at (P=0.05)

any additional source choline chloride, T<sub>1</sub> was supplemented with phytoadditive Repchol (supplied by Ayurvet Limited, Baddi, India) @ 500gm/tonne of feed and T<sub>2</sub> with synthetic choline (60% pure) (supplied by Mebros, Chembur, Mumbai, India) (T<sub>1</sub>) @ 1 kg/tonne of feed alongwith Biotin @ 150mg/tonne of feed from day 0-42, respectively. The birds were reared under standard managemental conditions in deep litter system and offered ad-libitum feeding and watering. Repchol is a polyherbal formulation comprising major constituent herbs namely Soy lecithin, Citrullus colocynthis, Trigonella foenum graecum, Nigella sativum and many more scientifically well known to mimic action like that of choline.

**Biochemical Analysis:** The serum biochemical estimations were carried out in ten birds sacrificed at scheduled intervals from each group. The blood samples were collected directly from heart into tubes without anticoagulant for separation of serum. The serum samples were maintained at -20 °C until analyzed. The individual serum samples were analyzed for cholesterol and triglyceride. The biochemical estimations were done by using Automatic Biochemical Analyzer '3000 revolution' made by Tulip's Diagnostic Pvt. Ltd., Mumbai. The methodology and the set of reagents used in respect of each parameter were as per the recommendations of the manufacturer of the analyzer system.

**Gross pathological examination:** it was done on representative ten birds per group at the end of study.

### Results and Discussion

**Serum Cholesterol:** The mean values of serum cholesterol in chicks of group T<sub>0</sub> at 21<sup>st</sup> day interval were significantly (P=0.05) higher (126.70  $\pm$  4.51) than the mean values of chicks in group T<sub>1</sub> & T<sub>2</sub> (119.50  $\pm$  2.55 and 106.70 $\pm$ 2.18) respectively (table1). On comparison of the mean values of within treatment groups, it was observed that the mean values were at par within the treatment groups at this interval. At 42<sup>nd</sup> day of study, the trend of mean cholesterol levels appear to be similar as at 21<sup>st</sup> day interval.

The significant (P=0.05) reduction in the mean values of serum cholesterol level in chicks of treatment groups was observed. Control group T<sub>0</sub> (141.70  $\pm$  4.62) had higher mean value than treatment groups T<sub>1</sub> & T<sub>2</sub>

(120.50  $\pm$  4.1 and 115.90  $\pm$  2.63), respectively, after 6<sup>th</sup> week. The addition of choline chloride (herbal/synthetic) in the diet of poultry significantly contributed in reducing cholesterol & regulating the fat metabolism in broilers. Supplementation of herbal choline can replace synthetic choline and biotin as evident by the comparable hypocholesterolemic effect produced by the two groups. The results in the present experimental study are similar to that observed by Kulinski et al., (2004), that deficiency of choline in ration exerts a hypercholesterolemic effect inhibiting the phosphatidylcholine synthesis in hepatocytes, thus causing fatty liver.

**Serum Triglyceride:** Mean values of serum triglycerides (mg/dl) in different groups of chicks at different interval are depicted in Table 2. It was observed that the serum triglycerides in chicks of all groups at 42<sup>nd</sup> day intervals of study were at par with each other, but the mean values serum triglyceride in chicks of group I were numerically higher than the mean values of all treatment groups. At 21<sup>st</sup> day interval of study serum triglycerides (mg/dl) in group T<sub>1</sub> (107.40  $\pm$  17.70) and group T<sub>2</sub> (89.40  $\pm$  4.03) did not differ significantly with each other. However, serum triglyceride levels in chicks of group T<sub>0</sub> (146.40  $\pm$  9.82) were significantly (P=0.05) higher than the levels in chicks of both the treated groups. From the data, it can be concluded that in chicks of group T<sub>0</sub> fed diet without any supplementation of choline/herbal source of choline, there was not complete protection to the liver. The results in the present study are in confirmation with those reported by Lombardi et al., (1968) that choline deficient rats suffered from fatty liver due to an impaired release of hepatic triglycerides into plasma indicating the role of choline in regulating lipid metabolism.

**Gross pathological studies:** The gross pathological examination of chicks of different groups when conducted did not showed any appreciable changes at 21<sup>st</sup> day interval of study period at 42<sup>nd</sup> day interval the chicks of group I on gross pathological examination revealed hepatomegaly with occasional necrotic foci in 10 chicks.

In few numbers of chicks the pectoral muscle showed focal minimal peticheal haemorrhages indicative of dehydration whereas, the chicks of group T<sub>1</sub> & T<sub>2</sub> did not showed any appreciable gross changes.

It was observed that the chicks in groups T<sub>1</sub> & T<sub>2</sub> did not showed any hemorrhages possibly could be due to addition of herbal product which might have protected the birds from the dehydration condition even after their exposure to summer stress, indicative of beneficial effects of the product used.

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