

## **Fish Oil Individual or Combination with L-carnitine on Broiler lipid profile**

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### **Abstract:**

This experiment was designed to study the influence of fish oil and l- carnitine and their combination on lipid profile of broilers Ross 308 chicks. One hundred fifty straight run 1-day -old chicks were distributed randomly into three equal groups, (50 birds/ treatment) with two replicates as following: 1) birds fed basal diet without any supplementation. 2) birds fed basal diet daily supplemented with 3% fish oil. 3) birds fed basal diet daily supplemented with 3% fish oil plus l-carnitine (50mg per Kg). All chicks received vaccine against Newcastle disease ND strain (B1) by spray at one day of age. Others vaccines of ND strain (Lasota) were administrated by drinking water at the age 10, 20, 30 days respectively. At the end of the experiment, blood samples collected then measured the lipid profile of chicks' blood serum. The significant improving of triglyceride, cholesterol, and HDL results were observed T3 birds received fish oil 3% and l-carnitine (50mg per Kg) of at age 32 days. Triglyceride, cholesterol, VLDL, and LDL were decreased ( $P \leq 0.05$ ) as compared with control. However, HDL was increased ( $P \leq 0.05$ ) as compared with control. In conclusion, fish oil plus l-carnitine can be used with broiler ration at a level (3% fish oil and l-carnitine (50mg /Kg) could enhance lipid profile and health status of broilers.

**Keywords:** Fish oil, L-carnitine, broiler, Lipid profile.

## زيت السمك بصورة مفردة او مزدوجة مع الكارنتين في الصفات الدهنية لفروج اللحم

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### المستخلص

صممت التجربة لدراسة تأثير زيت السمك وبروتين الكارنتين وخليطهما في الصفات الدهنية لافراخ اللحم نوع روز 308. مائة وخمسون فرخ بعمر يوم واحد غير مجنسة وزعت عشوائيا على ثلاث معاملات متساوية بواقع 50 طير لكل معاملة مع مكررين لكل معاملة وكالاتي: (1) غذيت على عليقة اساسية بدون اي اضافة (معاملة سيطرة). (2) غذيت على عليقة اساسية مضاف لها 3% زيت السمك. (3) غذيت على عليقة اساسية مضاف لها 3% زيت السمك + الكارنتين 50 ملغم/كغم علف. جميع الطيور لقحت بلقاح نيوكاسل ND عترة (B1) بالرش في اليوم الاول من العمر. لقحت الطيور جميعا بلقاح نيوكاسل عترة لازوتا في اليوم 10، 20، و 30 من العمر. في نهاية التجربة، تم جمع عينات الدم وحساب نسبة الدهون في مصلها. التحسن المعنوي لوحظ في نتائج الدهون الثلاثية والكوليسترول والبروتين الدهني عالي الكثافة HDL في المعاملة 3 والتي غذيت على 3% زيت السمك + الكارنتين 50 ملغم/كغم علف. الدهون الثلاثية والكوليسترول والبروتينات الدهنية منخفضة الكثافة LDL والمنخفضة جداً vLDL قد زادت معنوياً بنسبة احتمال ( $P \leq 0.05$ ) في المعاملة الثالثة بينما زاد HDL معنوياً في المعاملة الثالثة معنوياً ( $P \leq 0.05$ ) مقارنة بمعاملة السيطرة. نستنتج من الدراسة ان اضافة الدهون نوع زيت السمك بنسبة 3% مضاف لها البروتين الكارنتين قد يؤدي الى تحسن الصفات الدهنية لفروج اللحم بالاضافة الى تحسن الحالة الصحية.

**الكلمات المفتاحية:** زيت السمك، بروتين الكارنتين، افراخ اللحم، الصفات الدهنية.

### Introduction:

Polyunsaturated fatty acids (PUFA) like Omega-3 play main role in human nutrition. Omega-3 helps in reducing coronary artery diseases, diabetes, hypertension, arthritis and dermatitis (40). Consumption of long-chain omega-3 PUFA like docosahexaenoic acid (DHA, C22:6n-3) and eicosapentaenoic acid (EPA, C20:5n-3) ensures the membrane phospholipids of the brain (36). Chicken meat have low cholesterol and is considered healthier than other sources of animal protein. Omega-3 PUFA dietary supplements have been tested by (7) who found that diet rich with omega-3 led to decrease fat and cholesterol contents of poultry meat. Alternative strategies to produce low cholesterol meat with dietary manipulations to modify the fatty acid composition of meat . Moreover, poultry meat and eggs enrichment with

omega-3 is a successful method to ensure an adequate supply of omega-3 PUFA to consumers. It has been shown that omega-3 PUFA ( $\alpha$ -linolenic acid ALA, 18:3n-3) in poultry meat was improved by increasing omega-3 PUFA in poultry diets levels of through of vegetable oils (27, 39, 44) or oily fish by-products (28; 11).

Many positive effects by dietary omega-3 PUFA have been confirmed including anti-oxidative properties, immune response, lipid peroxidation and (43, 13, 17, 22, 23, 18, 19, 20, 21).

L-carnitine is a water soluble amine that exists naturally in animals, plants and microorganisms. Liver is the major site for biosynthesizing of l-carnitine in vivo from two lysine and methionine amino acids (33) in the presence of nicotinic acid, ascorbic acid, vitamin B6, and folic acid. Requirement of these vitamins as co-factors in the metabolic pathway of l-carnitine for the enzymes involved (34, 15, 35, 8, 5). It has been reported that l-carnitine has two major functions. L-carnitine facilitate the transport of long-chain fatty acids across the mitochondrial membrane and generate adenosine triphosphate leading to improve energy utilization by promoting  $\beta$ -oxidation of these fatty acids (32, 31).

The hypothesis of our study was omega-3 enriched broiler diet may be increase levels of this PUFA type omega-3 in broiler meat. Adding of l-carnitine may enhance lipid metabolism. The present experiment was conducted to study the effects of diet contained 3% fish oil with or without l-Carnitine (50mg per Kg) on broiler serum cholesterol, triglycerides, HDL, LDL, VLDL.

## **Materials and Methods**

### **Experimental design**

One hundred fifty straight run 1-day -old chicks were distributed randomly into three equal groups, (50 birds/ treatment) with two replicates as following: 1) birds fed basal diet without any supplementation. 2) birds fed basal diet daily supplemented with 3% fish oil. 3) birds fed basal diet daily supplemented with 3% fish oil plus l-carnitine (50mg per Kg). All chicks received vaccine against Newcastle disease ND strain (B1) by spray at one day of age. Others vaccines of ND strain (Lasota) were administrated by drinking water at the age 10, 20, 30 days respectively.

### **Rearing Program**

All chicks were managed according to (6). water and Feed were provided *ad-libitum* during the experiment (35 days). Diets were formulated to meet requirements by the National Research Council (30) table (1). Lighting program was provided as a whole day light with only one hour cut off. A two-phase feeding program were used. A starter diet (1-21 days of age) and finisher (22-35 days of age) was provided in broilers feeding program.

### **laboratory analysis:**

Blood samples were collected randomly from six broilers of each treatment from the bronchial vein by using a test tube without anticoagulant on day 35<sup>th</sup> of age. After clotting of blood, 10 minutes at 3000 rpm to obtain serum by using a centrifuge . Then, stored in a deep freeze (-20C°) (1). Cholesterol, triglycerides, HDL, LDL, and

VLDL concentration were measured by using of diagnostic kit and spectrophotometer.

### Statistical analysis:

One-Way ANOVA were used to analyze all data by using the GLM procedure SPSS, 22 (41). Means were deemed significantly different at ( $p \leq 0.05$ ) and separated using Duncan's Multiple Range Test.

**TABLE 1: compositions of experimental diet according to (NRC, 1994)**

Ingredient %	Starter diet			Finisher diet		
	T1	T2	T3	T1	T2	T3
<i>Yellow corn</i>	36	36	36	44	44	44
<i>Soybean meal(48% pro-</i>	30	30	30	26	26	26
<i>Wheat</i>	26	26	26	20	20	20
<i>Protein concentrate</i>	5	5	5	5	5	5
<i>Sunflower oil</i>	1.5	1.2	1.2	3.5	3.20	3.20
<i>Fish oil''</i>	-	0.3	0.3	-	0.3	0.3
<i>L-Carnitine (mg\ Kg)</i>	-	-	50	-	-	50
<i>Premix*</i>	0.1	0.1	0.1	0.1	0.1	0.1
<i>Lime stone</i>	1	1	1	1	1	1
<i>Salt</i>	0.3	0.3	0.3	0.3	0.3	0.3
<i>Dicalcium phosphate</i>	0.1	0.1	0.1	0.1	0.1	0.1
<i>Total</i>	100	100	100	100	100	100
<b>Calculated chemical analysis</b>						
<i>Metabolize energy (kcal/kg)</i>	2926	2926	2926	3097.8	3097.8	3097.8
<i>Crude protein (%)</i>	22.4	22.4	22.4	20.5	20.5	20.5
<i>Calcium (%)</i>	0.82	0.82	0.82	0.80	0.80	0.80
<i>Available phosphorus (%)</i>	0.61	0.61	0.61	0.58	0.58	0.58
<i>Methionine (%)</i>	0.61	0.61	0.61	0.58	0.58	0.58
<i>Lysine (%)</i>	1.74	1.74	1.74	1.63	1.63	1.63

\* Premix produced in Jordan (VAPCO®) which contains: vit A 8000000 IU; vit D3 1500000 IU; vit E 1000 IU; vit K3 2000 mg; vit B1 500 mg; vit B2 500 mg; vit B6 200 mg; vit B12 8 mg; ca pantothenate 400 mg; nicotinamide 6000 mg; folic acid 50 mg; methionine 13 mg; lysine 61 mg; aspartic acid 92 mg; glutamic acid 166 mg; cysteine 1 mg; valine 40 mg; tyrosine 9 mg; glycine 382 mg; arginine 117 mg; leucine 48 mg; phenylalanine 40 mg; Mn sulphate 0.40 gm; zinc sulphate 0.15 gm; iron sulphate 0.50 gm; copper sulphate 0.04 gm; cobalt chloride 0.01 gm.

### Results and Discussions:

The significant improvement of triglyceride, cholesterol, and HDL results were shown in table (2). Chicks were received fish oil 3% and l-carnitine (50mg per Kg) at

age 32 days of T3 birds have better enhancement of lipid profile. Triglyceride, cholesterol, VLDL, and LDL were decreased ( $P \leq 0.05$ ) as compared with control. However, HDL was increased ( $P \leq 0.05$ ) as compared with control.

**Table (2) The effect of Fish oil with or without l-carnitine on serum lipid profile concentration (mg/dl) at 32 day old chicks. Mean  $\pm$  SE.**

Treatments		T1	T2	T3
Parameters				
<b>Ross 308</b>	<b>Cholesterol</b>	160.21 $\pm$ 1.48 B	110.08 $\pm$ 0.69 AB	97.95 $\pm$ 1.16 A
	<b>HDL</b>	27.61 $\pm$ 0.18 C	31.08 $\pm$ 0.24 B	36.15 $\pm$ 0.28 A
	<b>LDL</b>	96.43 $\pm$ 0.69 B	51.93 $\pm$ 0.74 A	41.39 $\pm$ 1.01 A
	<b>VLDL</b>	36.16 $\pm$ 1.11 B	27.06 $\pm$ 1.20 AB	20.07 $\pm$ 1.29 A
	<b>Triglyceride</b>	180.82 $\pm$ 0.40 C	135.33 $\pm$ 1.04 B	102.03 $\pm$ 0.45 A

Different letters in the same row denoted that significant differences between treatments at a level ( $p \leq 0.05$ ).

Reduce serum triglycerides and cholesterol may be due to omega-3 reduces triglycerides by decreasing hepatic synthesis, secretion VLDL by inhibiting various enzymes due to its effects on the specific gene expression. Omega-3 suppressing activity of lipoprotein lipase. It's an enzyme that act to hydrolyze triglyceride and cholesterol from VLDL particles in the tissue. The results of the experiments are in agreement with (42, 26, 16, 24, 12, 9, 17) they were reported that omega-3 have been reduced serum cholesterol and triglycerides concentration. Omega-3 may reduce cholesterol due to inhibition liver enzymes 5-hydroxy-3-methylglutaryl-coenzyme A reductase (HMG-Co A). Our results are in agreement with (2,10, 29, 17) reported that supplementation of broilers diet with fish oil or cod liver oil led to reduced serum cholesterol and triglycerides concentration significantly. Also (14) who reported that cholesterol and triglycerides in quail serum were reduce significantly after feeding with flaxseed or fish oil enriched ration. The results are in disagreement with suggestion (37, 38) reported that no significant differences of serum cholesterol, triglycerides, and VLDL after supplemented broiler diets with fish oil led to.

### Conclusion:

In conclusion, fish oil plus l-carnitine can be used with broiler ration at a level (3% fish oil and l-carnitine (50mg /Kg) could be enhance lipid profile and health status of broilers.

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