Evaluation of Weight Reducing Effect of Evening Primrose Oil

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Abstract: Weight reducing effect of Evening primrose oil in healthy rabbits was assessed following administration of EPO for 60 days in the doses of 90, 180 and 360 ul/Kg. Reduction in weight might be due to significant decrease in cholesterol, triglycerides, LDL-C, blood glucose and increase in HDL-C.

Keywords: Evening primrose oil, gamma-linolenic acid, cholesterol, triglycerides, blood glucose.

INTRODUCTION

Dietary fats have a profound impact on plasma lipids and lipoproteins; this may explain many of the effects of lipids on risk factors for several major diseases. Hence dietary intake of essential fatty acids (EEA) or polyunsaturated fatty acids is generally recommended in place of saturated fatty acids (SFA). Gamma-linolenic acid (GLA) is an essential polyunsaturated fatty acid. There is also scientific evidence that GLA rich oils are effective in the treatment of cardiovascular diseases, age-related diseases, alcoholism, gastric ulceration, atopic eczema, diabetic neuropathy, arthritis, dysmenorrhea, breast pain, alleviation of symptoms of pre-menstrual syndrome [1, 2] and antitumor activity [3].

Evening primrose oil ***(Oenothera biennis)*** appears to be clinically the most effective source of GLA among plant and fungal. It also contains linoleic acid (LA), oleic acid, tocopherol, phenolic compounds etc. [4, 5]. Animals have only a limited capacity to synthesize these essential fatty acids, which must come from dietary sources [6] They are important for various physiological functions in the human body, which may explain apparent effectiveness of EPO in various diseases [7]. Present study was specifically designed to determine its effect on weight of animals, lipid profile and blood glucose.

Animals

The study was carried out on forty white, healthy rabbits of either sex and had a mean body weight of 1300 ± 50 grams. Body weight of the animals was measured weekly. They were housed individually in cages, under controlled condition of temperature 23 ± 2° C. Diet and water was provided ad labium. Animals were divided in four groups, each containing 10 animals. One served as control group, while three groups received EPO orally on daily basis in the doses of 90, 180 and 360 µl/kg for a period of 60 days and categorizing rabbits as normal, moderate and high dose animals respectively. Control animals received water orally equivalent to the volume of respective doses according to their body weight.

Sample Collection

Blood samples of 5ml were collected twice, once in the mid of the dosing period *i.e.* at 30 day and other at the end of dosing period *i.e.* 60 days from marginal vein of the animals, in gel tube for lipid profile and glucose monitoring.

Biochemical Testing

Serum was immediately separated out by centrifuging blood samples at 3000 rpm for 15 minutes in 14K Humax centrifuge and was analyzed within 3 hours of sample collection. We used standard reagent kits of Merck on Humalyzer 3000 to determine the basic serum lipid profile *i.e.* concentration of total cholesterol, triglycerides, High-density lipoprotein-cholesterol (HDL-C), Low-density lipoprotein-cholesterol (LDL-C) and glucose.

Statistical Analysis

All values will be compared with the controlled by taking mean of all of them and the significance of difference between means will determined by student

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Table – 1: Effect of Different Doses of EPO on Weight

	Time Interval (Weeks)	Control group	EPO doses µl/kg		
			90	180	360
Average weight variation (gm)	1st	1252±8.2	1257±9.2	1278±9.6	1263±9.3
	2nd	1197±16	1191±20	1183±39	1179±19
	3rd	1130±3.1	1148±15	1127±11	1146±7.1
	4th	1132±12	1131±13	1136±10	1132±4.1
	5th	1139±12	1138±9.5	1135±12	1127±4.5
	6th	1142±7	1138±6.5	1131±6.5	*1123±4.8
	7th	1147±8.3	*1118±8.7	*1116±8	*1110±15
	8th	1159±30	1118±14	*1076±26	**1045±14

n = 10; Average ± SEM; *p < 0.05 as compared to control; **p < 0.005 as compared to control

significance t-test. Values of P<0.05 will considered as significant and P<0.005 as highly significant.

RESULTS

Table **1** show the effect of different doses of EPO on the weight of treated and control animals during the period of 8 weeks of dosing. Animals at normal dose showed 139 ± 12 gm decrease in average weight. Animals at moderate dose showed persistent decrease of 200 ± 15 gm in average weight. While animals at high dose showed 218 ± 14 gm decrease in average weight at the end of study which was highly significant.

Tables **2** and **3** reveals the comparison of HDL, LDL, total cholesterol, triglycerides and glucose levels at 30 and 60 days respectively at normal, moderate and high doses of evening primrose oil. After 30 day animals at moderate and high dose showed significant rise in HDL *i.e.* 3.46 ± 0.49 and 3.33 ± 0.47 mmol/L respectively as compared to control. Whereas after 60 days animals at normal dose showed significant rise in HDL *i.e.* 4.10 ± 0.75 mmol/L, however at moderate and high doses increase was highly significant *i.e.* 4.70 ± 0.53 and 4.68 ± 0.54 mmol/L respectively as compared to control *i.e.* 1.87 ± 0.49 mmol/L. The decrease in LDL levels after 30 days was insignificant, however after 60 days there was significant decrease in LDL levels at all doses as compared to control *i.e.* 10.91 ± 1.00, 9.87 ± 2.80 and 9.19 ± 2.60 mg/dl in comparison to control animals *i.e.* 30.6 ± 5.90 mg/dl. Similarly total cholesterol was also insignificantly reduced after 30 days but after 60 days the decrease was significant *i.e.* 30.7 ± 3.80, 29.1 ± 4.60 and 29.0 ± 5.00 mg/dl as compared to control animals *i.e.* 54.7 ± 8.00 mg/dl. While decrease in triglycerides was only significant at moderate and high doses after 60 days *i.e.* 75.6 ± 10 and 75.8 ± 11 mg/dl in comparison to control animals *i.e.* 111.5 ± 13 mg/dl.

Glucose levels were significantly reduced after 30 days in animals at all doses *i.e.* 115.9 ± 9.50, 113.9 ± 10 and 112.1 ± 12 mg/dl in comparison to animals of control group *i.e.* 143 ± 8.90 mg/dl. After 60 day animals at normal dose showed significant decrease in glucose *i.e.* 116.4 ± 8.90 mg/dl, While at moderate and

Table – 2: Effect of EPO on Lipid Profile and Glucose in Different Doses at 30 Days

Parameters (mg/dl)	Control	Baseline lipid & glucose	EPO doses µl/kg		
			90	180	360
HDL (mmol/L)	1.87±0.49	1.03 – 1.55	2.75±0.44	*3.46±0.49	*3.33±0.47
LDL (mg/dl)	30.60±5.90	25 - 200	18.81±2.00	21.0±3.30	17.8±5.90
Cholesterol (mg/dl)	54.7±8.00	50 -200	41.0±4.10	38.5±4.30	38.2±7.40
Triglycerides (mg/dl)	111.5±13	100 - 500	98.7±9.60	80.2±9.70	80.2±8.80
Glucose (mg/dl)	143±8.90	70 - 200	*115.9±9.50	*113.9±10	*112.1±12

n = 10; Average ± SEM; *p < 0.05 as compared to control

TABLE – 3: Effect of EPO on Lipid Profile and Glucose in Different Doses at 60 days

Parameters (mg/dl)	Control	Baseline lipid & glucose	EPO doses µl/kg		
			90	180	360
HDL (mmol/L)	1.87±0.49	1.03 – 1.55	*4.10±0.75	**4.70±0.53	*4.68±0.54
LDL (mg/dl)	30.60±5.90	25 - 200	*10.91±1.00	*9.87±2.80	*9.19±2.60
Cholesterol (mg/dl)	54.7±8.00	50 -200	*30.70±3.80	*29.10±4.60	*29.00±5.00
Triglycerides (mg/dl)	111.5±13	100 - 500	78.6±12	*75.6±10	*75.8±11
Glucose (mg/dl)	143±8.90	70 - 200	*116.4±8.90	**100.5±2.20	**100.1±16

n = 10; Average ± SEM; *p < 0.05 as compared to control; **p < 0.005 as compared to control

high doses there was highly significant decrease *i.e.* 100.52 ± 2.20 and 100.1 ± 16 mg/dl in comparison to control animals *i.e.* 143 ± 8.90 mg/dl.

DISCUSSION

In whole period of experiment significant weight loss was found. Initial loss in weight of animals might be due to variation in diet that gradually recovered. However there was significant decrease in weight till the end of study as compared to control, compatible with Shotton et al. report. This decrease in weight may be due to lowering the low density lipoprotein, cholesterol and glucose caused by GLA [8], present in evening primrose oil [9, 10]. Woltil et al., also reported the low birth weight infants by EPO and fish oil [11].

Present study reveals decreased blood glucose level at all three doses. Previous studies suggest that combine administration of lipoic acid and GLA as dietary supplement has decrease blood glucose levels in diabetes [12]. There is evidence that administration of evening primrose oil reduces the symptoms of diabetic neuropathy [13], due to the presence of GLA and linolenic acid [14]. Balance between vasodilator and vasoconstriction prostaglandins could be altered by hyperglycemia [15, 16]. Evening primrose oil has been reported for their role in correction of the vasodilator deficiency by promoting prostacyclin synthesis [17]. Vitamin E in evening primrose oil by scavenging of super-oxide may improve vasodilator nitric oxide [8].

Decrease blood glucose levels in present study might also be the result of decrease level of plasma fibrinogen, factor VII and vWF by evening primrose oil [18]. Since there is evidence that vWF, fibrinogen, and factor VII levels are found to be elevated in diabetes in humans [17]. Hence it may be concluded that decrease levels of fibrinogen, factor VII and vWF may leads to decrease blood glucose level.

Number of studies provides evidences for anti-inflammatory response of evening primrose oil in various disorders [19-21]. Increase level of plasma HDL by evening primrose oil might also be the result of its anti- inflammatory effect. Since plasma HDL levels and inflammation are interrelated [22].

In present study there was significant reduction in triglyceride after 60 day at moderate and high doses and in total cholesterol and LDL after 60 day at all three doses of EPO, which was in accordance to previous finding [23]. There was a significant increase in HDL level after 30 days and continued up to 60 days, compatible with hypothesis [9]. This variation in the levels of lipids may be due to GLA alone or with linoleic acid. Hence both have been reported to possess lipid-lowering properties [5]. Oleic acid, one of the components of evening primrose oil, also has been associated with a lower risk of coronary heart disease [24]. Lipid lowering effect in present study might also be due to anti-atherogenic effect of vitamin E and antioxidizing effect of high phenolic contents [25-29].

The results of the present study demonstrate that treatment with EPO can cause weight reduction and prevent diabetes, since all the rabbits treated with EPO revealed euglycemic and hypocholesteremic effects. Biological potency and effectiveness of evening primrose oil mainly depends on the presence of gamma-linolenic acid [30, 31] and give its desirable cardiovascular, weight reduction, blood pressure lowering [32, 33], hypocholesteremic and hypoglycemic effects [18].

CONCLUSION

Evening primrose oil may retard the progression of atherosclerosis and prevent cardiovascular diseases not only through its anticoagulant and anti-inflammatory affect but also through its weight reduction effect. It could be safely stated that animal's weight reduction might be the result of its hypoglycemic and hypolipidemic effects. All these responses in present study were found to increase with the increasing days of drug administration. However there has not been much difference in response with respect to increase in dose. The 90µl/kg dose seems to be pharmacologically effective. Further studies are required for toxicological evaluation.

ABBREVIATIONS

EPO = Evening primrose oil

GLA = Gamma-linolenic acid

HDL-C = High density lipoprotein

LDL-C = Low density lipoprotein.

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