



Nutritional and biotechnological means of enhancing nutraceutical value of milk through conjugated linoleic acid (CLA) content and its anticarcinogenic potency

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Article History

Received: 30 May 2017
Accepted: 12 July 2017
Published: July-December 2017

Citation

Kathirvelan C, Banupriya S, Tyagi AK. Nutritional and biotechnological means of enhancing nutraceutical value of milk through conjugated linoleic acid (CLA) content and its anticarcinogenic potency. *Drug Discovery*, 2017, 11(30), 11-13

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General Note



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ABSTRACT

A study was conducted to investigate influence of conjugated linoleic acid (CLA) feeding on cancer incidence in 7, 12 dimethyl benz (a) anthracene (DMBA) induced mammary gland carcinogenesis and oxidative stress in rats. Female Wistar rats of 21 day age were divided into two groups of 30 animals each and fed with soybean oil (SBO) and CLA ghee based diets, respectively. Soybean oil and CLA ghee was included at 20 % level in their respective diets. Animals of two group were administered with chemical carcinogen DMBA @ 5 mg per animal as single dose by oral intubations at the age of 55th day. Feeding of test diets were continued up to 32 weeks after DMBA administration. At the end of 32 weeks, animals were sacrificed, tumour data recorded and histopathology done and analyzed for liver and mammary gland lipid peroxidation. Tumour incidence in SBO group and CLA ghee group was 83.33 and 46.07 per cent respectively. Histopathology revealed fibroma, adenoma, fibroadenoma in all the groups whereas SBO group showed adenocarcinoma. In liver, CLA ghee feeding lowered lipid peroxidation (Thiobarbituric Acid Reactive Substances, 68.37 ± 1.71 nmole/g tissue) than in SBO group (86.73 ± 1.52 nmole/g tissue) and in mammary gland, CLA ghee feeding reduced lipid peroxidation 48.69 percent compared with SBO group. Therefore, results of present study showed CLA not only inhibited benign type tumour but malignant tumour as well and reduced lipid peroxidation.

Keywords: lipid peroxidation; malignant tumour; conjugated linoleic acid

INTRODUCTION

Recent evidences of epidemiological linkages between diet and chronic diseases have prompted the search for new clinical insights into the relationship between food and the onset (or prevention) of disease.

The whole milk contains an average 4.5 mg CLA/g of fat (Kelly *et al.*, 1998). Recent studies have shown that the milk fat content of CLA can be markedly enhanced by several dietary manipulation especially those involving dietary additions of plant oils which are high in unsaturated fatty acids (Griinari and Bauman, 1999)

CLA has received considerable attention as a chemo preventive agent (Kathirvelan and Tyagi, 2009) against skin carcinogenesis (Ha *et al.*, 1990). Therefore, an experiment was carried out to study conjugated linoleic acid enriched ghee feeding on cancer incidence in 7, 12 dimethyl benz (a) anthracene induced breast cancer in rats

METHODS AND MATERIALS

Ghee preparation

Low (6.92 mg/g fat) and high CLA (19.54 mg/g fat) ghee was prepared from milk of buffaloes which are maintained on groundnut oil cake and mustard oil (2 %) based concentrates, respectively by creamery method.

Cancer study

Female Wistar rats 21 days of age (32 to 38 g of body weight) were randomly divided into 3 groups of thirty animals each and group I animals fed with soybean based diet where as group II and group III animals were fed with low CLA and high CLA ghee based diet, respectively. The rat diets were prepared according to the AOAC (1995) guidelines and ghee was included 20 % in the rat diet. Feeding experiment was conducted for a period of 32 weeks after 7, 12 DMBA injection.

At 55 days of age, each animal was administered with 5 mg 7, 12 Dimethyl benz(a)anthracene (DMBA) in soybean oil by oral intubation as single dose. At the end of the experimentation period, animals were sacrificed by cervical dislocation and tumour incidence and tumour weight were calculated. A portion of mammary gland was preserved in 10% formal saline for histopathological study. The data were subjected to analysis of variance and statistical significance was accepted at ($P < 0.05$).

RESULTS

Table 1, summarizes the data on tumour incidence and mean tumour weight from each cancer group. CLA ghee feeding produced statistically significant ($P < 0.05$) reduction in tumour incidence and it has noticed that 37% reduction in gross tumor incidence in CLA ghee fed group. CLA ghee fed rats have lowest ($P < 0.05$) mean tumour weight than the Soybean oil group. Fibroma, adenoma, and fibroadenoma were the common types of tumours in both the groups. However, malignant type tumour (adenocarcinoma) was

detected only in those rats fed on soybean oil diet. The CLA ghee feeding resulted in lowered level of thiobarbituric reactive substances (Table 2) than the soybean oil based diet.

Table 1. Effect of conjugated linoleic acid enriched ghee feeding on mammary gland tumour incidence in 7, 12 DMBA administered rats

Groups	Percent tumour incidence*	Percent Individual tumour incidence				Mean tumour weight (g)
		Fibroma	Adenoma	Fibro adenoma	Adenoma carcinoma	
Soybean oil	83.33 ^a (25/30)	36.00 (9/25)	24.00 (6/25)	28.00 (7/25)	12.00 (3/25)	3.30 ^a ± 1.39
High CLA ghee	46.70 ^b (14/30)	57.14 (8/14)	14.29 (2/14)	28.57 (4/14)	0.00	1.29 ^b ± 0.27

Rats were killed 32 weeks after DMBA administration

Values with different superscript in coloum differ at (P<0.05)

Table 2. Effect of feeding soybean oil and CLA ghee based diet on TBARS in liver and mammary gland in control and cancer groups (at end of experiment)

Group		TBARS	
		Liver (nmole/g tissue)	Mammary gland (nmole/g tissue)
Control	Soybean oil	57.88 ^a ± 0.92	20.47 ^a ±0.50
	CLA ghee	26.6 ^b ±1.61	15.67 ^b ±0.29
Cancer	Soybean oil	86.73 ^c ±1.52	28.19 ^c ±0.51
	High CLA ghee	68.37 ^d ±1.71	19.28 ^d ±0.61

Values are mean ±SE for n=12

Mean values in a column atleast one superscript in common do not differ significantly at (P<0.05) and mean values with no superscript in common are significantly different at (P<0.05)

CONCLUSION

The present study showed that CLA supplemented diet significantly lowered cancer incidence. CLA not only inhibited benign type tumour but malignant tumour as well. Prevention, rather than therapy, must be an important strategy for conquering cancer and CLA could well do that.

Funding:

This study has not received any external funding.

Conflict of Interest:

The authors declare that there are no conflicts of interests.

Data and materials availability:

All data associated with this study are present in the paper.

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