Lecithin intake and serum cholesterol[1,2]

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ABSTRACT To find out whether the consumption of lecithin has a more beneficial effect on serum cholesterol than does the consumption of equivalent amounts of polyunsaturated oils, we scrutinized 24 studies on the effect of supplementary lecithin intakes ranging from 1 to 54 g/d. Most of the studies lacked an appropriate control group, had a small sample size, or had changes in intake of other foods because of increased energy intake from lecithin. In only four trials were attempts made to balance fatty acid intakes of control and experimental groups. There is no evidence for a specific effect of lecithin on serum cholesterol independent of its linoleic acid content or secondary changes in food intake. The observed lecithin-induced hypocholesterolemic effects found in various studies were artifacts caused by the design and the manner of data analysis, were mediated by other dietary changes, or were due to the linoleic acid present in lecithin. *Am J Clin Nutr* 1989;49:266–8.

KEY WORDS Cholesterol, phosphatidylcholines, diet

Introduction

Lecithin is the trivial name for a class of phospholipids officially referred to as phosphatidylcholines. It has the structure of a triglyceride in which one fatty acid moiety at the number 1 carbon of the glycerol has been replaced by phosphocholine. Phosphatidylcholine is an important component of biomembranes and of lipoproteins. It is synthesized in the human body and is not considered an essential nutrient.

Although lecithin was originally isolated from egg yolk, at present soybeans are the main source. Commercial preparations vary widely in composition (1) and in addition to true lecithin, ie, phosphatidylcholine, they may contain cephalin, phosphatidylinositol, sterol glycosides, and soybean oil.

Lecithin preparations are widely consumed for health reasons (2, 3); they are thought to have favorable effects on cholesterol metabolism, brain function, and other processes. In the Netherlands nine different proprietary lecithin preparations are available. A cholesterol lowering effect is claimed by seven brands. This prompted us to scrutinize the literature to find out whether the alleged hypocholesterolemic effect of oral lecithin has been substantiated experimentally. More specifically, we wanted to know whether lecithin has a specific effect on serum cholesterol that is independent of the linoleic acid moiety of this compound.

Methods

Table 1 summarizes all studies on the effect of lecithin on serum cholesterol that we are aware of. Studies that lasted < 1 wk and those in which lecithin was administered intravenously were not included.

Only a few studies (17, 20, 24, 26) tried to control for the effect on serum cholesterol of the fatty acids that are present in lecithin. For example, in the study of Greten et al (17) the subjects first received a diet with 10 g soybean oil followed by a diet with 18 g lecithin. In the study of Childs et al (20) two groups first received a diet with 36 g lecithin followed by a diet with 30.5 g corn oil while a third group received the same diets but in reverse order. In the study of Prack et al (24), which consisted of two periods, one group first received a diet with 6.3 g pure phosphatidylcholine, while another group received a diet with 8.8 g sunflower oil. In the second period the diets were reversed. In the study of Kesäniemi and Grundy (26) the subjects received a control diet with 7 g safflower oil in the control period and 10 g lecithin in the experimental period. Using the formula of Keys et al (27) we calculated that in these four controlled studies, the anticipated differences in serum cholesterol as a result of differences in the fatty acid compositions of the lecithin preparations and the lecithin substitutes were < 0.04 mmol/L. Thus cholesterolemic effects imposed by the fatty acids in lecithin were almost completely controlled for. In the study of Vroulis et al (20) a placebo was used but the exact composition of the placebo was not given.

Most studies (Table 1) were small in sample size (4–6, 12,

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TABLE 1
Summary of studies on the effect of soy lecithin on serum total cholesterol

Reference	Number of subjects	Control period or group*	Amount of lecithin	Duration	Initial serum cholesterol	Effect on serum cholesterol
			g/d	*wk*	*mmol/L*	*%*
(4)	5	−	12–15	4–11	19.0	−58
(5)	8	−	25	6–10	9.2	−20†
(6)	4	−	18–54	8–15	11.2	−3.9
(7)	15	−	36	13	9.8	−30
(8)	8	−	0.7–1.9	13	9.1	−11
(9)	19	−	?	4–38	8.9	−27
(10)	29	−	?	61	7.5†	−31‡
(11)	12	−	1.2–2.4	10–20	11.0	−3.3
(12)	5	−	?	9	7.7	+3.5
(13)	12	−	1.8	8	8.3	−12
(14)	69	−	1.8	7.5	7.9	−8.0§
(15)	10	−	4.5–30	9–39	8.8	−6.8
(16)	5	−	4.5–30	9–19	8.4	−4.1
(17)	8	+	18	1.5	7.7	−6.1‖
(18)	5	−	48	104	6.1	−15.0¶
(19)	10	−	22.5	4	4.2	−3.7
(20)	18	+	36	9	5.8	+5.4**
(21)	6	−	6	2	5.9	−2.6
(22)	8	−	6	4	4.9	−5.8
(22)	10	−	35	9–13	5.5	−6.3
(23)	34	−	45	4	6.9	−7.4††
(24)	9	+	6.6	6	4.5	+17.0‡‡
(25)	100	−	18	4	7.6	−17.8§§
(26)	10	+	5	5	6.1	0.0

* Involving a lecithin substitute with a fatty acid composition similar to that of lecithin preparation.
† After 4–5 wk of treatment the serum cholesterol levels returned to base-line levels even though the lecithin feeding was continued. The change in serum cholesterol level was calculated by the authors using the lowest cholesterol level obtained during lecithin feeding, not the value at the end of the period of lecithin feeding.
‡ Results for 19 patients only. In the remaining 10 patients the serum cholesterol level did not change significantly; their data were excluded by the authors. Changes were estimated by us from a figure in the paper.
§ Change estimated by us from figure in paper.
‖ Effect of lecithin relative to that of soy oil. The changes were estimated by us from a figure in the paper.
¶ Effect of lecithin and low fat diet relative to that of low fat diet alone.
** Effect of lecithin relative to that of corn oil.
†† Change when compared with a control group that was not treated with lecithin.
‡‡ Effect of lecithin relative to that of sunflower oil.
§§ Effect of lecithin and hypocaloric diet relative to that of hypocaloric diet alone.

16–18, 21, 24) and used < 9 subjects. In one study the reported decline in serum cholesterol was overestimated because the data of nonresponsive subjects were not included in the analysis (10). In another study the effect was calculated using the lowest cholesterol level obtained during lecithin feeding, although this lowering was in fact transient (5). One study measured the response of serum cholesterol to dietary lecithin in subjects who were simultaneously receiving a hypocaloric diet (25). Only a few papers (11, 17, 20, 24, 26) give information about the control of other variables that influence serum cholesterol, such as composition of diet and changes in body weight.

Results

Some of the early studies (4, 5, 7, 9, 10) reported marked reductions of 20–58% of serum cholesterol in hyperlipidemic patients on ingestion of large quantities (12–54 g/d) of soy lecithin. However, most investigators noted only small changes in serum cholesterol concentration or none at all. None of the four studies that tried to control for the effect of linoleic acid present in lecithin (17, 20, 24, 26) produced a significant lecithin effect; in two of these four studies (20, 24) the effect of lecithin was actually less favorable than that of an equivalent amount of corn oil or sunflower oil.

Discussion

At an intake level of 25 g, lecithin provides ~228 kcal (950 kJ). If foodstuffs rich in saturated fat, such as beef, cheese, butter, or hard margarines, are replaced by leci-

thin, this would by itself lower serum cholesterol (27). Lecithin is also rich in linoleic acid; on a weight basis it contains on average 60–65% linoleic acid (17, 20, 24, 26). Therefore lecithin-specific effects can only be detected by providing equivalent amounts of fatty acids from another food source during a control period or to a control group so as to balance the effect of the fatty acids in the lecithin ingested by the experimental group. In only four studies were attempts made to balance fatty acid intake in the control and experimental diets (17, 20, 24, 26).

Thus, there are many reports on the effect of lecithin on serum cholesterol concentration but most of these were poorly designed. The combined results of the four appropriately controlled trials suggest that dietary lecithin does not lower serum cholesterol in man. We propose that the observed lecithin-induced hypocholesterolemic effects found in various studies were either artefacts caused by the design and the manner of data analysis, or were mediated by changes in the rest of the diet, or were due to the linoleic acid present in lecithin. In view of the high price of lecithin preparations compared with soybean oil, patients might be better off spending their money on regular foods rich in linoleic acid. ■

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