

Olive Oil and Blood Cholesterol Levels

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THE nutritionist today must think more and more in terms of hygiene and preventive medicine. It is particularly this aspect which has stimulated this study. What fatty substance should be recommended to avoid increased cholesterol levels? To be sure, such increased levels are not synonymous with atheromatosis, but the coexistence of the biologic and anatomic conditions is so frequent that one cannot disregard it. To maintain blood cholesterol within normal limits does not present any danger and may well prevent serious disorders.

At present, oils containing highly unsaturated fatty acids, such as corn, sunflower or soya oil, are used on an extensive scale, although their specific action continues to be a subject of debate. They are not routinely used in culinary practice and are generally not introduced in dietetics until a high cholesterol level has been established. What many individuals expect is preventive dietetic advice. In our opinion, the considerable value of olive oil as a seasoning fat has not been sufficiently stressed.

The constant use of olive oil does not bring about adverse effects on the cholesterol level. This is what we propose to demonstrate by citing certain earlier studies, of which there are actually few, and by incorporating the results of our own study into the discussion.

It is a well known fact that the Mediterranean peoples, who are great consumers of olive oil, are generally less affected with atheromatosis than the Anglo-Saxon. Brozek *et al.*¹ have made a study in Zagreb comparing the cholesterol level of subjects from two regions:

one in which 90 to 95 per cent of the total dietary lipids consumed consisted of animal fats, and the other, in which it consisted of olive oil, the daily average of oil consumed being 85 gm. (3 oz.). The total intake of lipids is comparable in the two regions compared, and represents 30 per cent of the total calories in the diet. In subjects of identical age and height, free from any disease capable of affecting cholesterolemia, the lowest average level of blood cholesterol, i.e., 201 mg. per 100 ml. was observed in the subjects on a diet of olive oil as against 240 mg. per 100 ml. among the consumers of animal fats.

Anderson, Keys and Grande² have studied the effects of fatty diets. When 50 gm. (1.8 oz.) of olive oil are consumed with a diet low in lipids, there is a drop in the cholesterol level, but one that is smaller than with a diet low in fat only.

In South Africa, Bronte-Stewart and his associates³ have conducted another study in volunteer subjects of three different demographic groups: Bantu, Cape Coloured and Europeans. One of the most interesting results of the study was the discovery that 200 gm. (7 oz.) of olive oil ingested over a period of six days did not raise the cholesterol level which, however, was raised by lipids of animal origin. The objection that can be raised in connection with these results is that the study lasted only six days, which is indeed a very short period of observation.

Even these few facts are quite significant. We wished to confirm them conclusively and carried out a study under the following conditions: (1) Extended the period of observation over a much longer and consequently more conclusive period of time. Our first study lasted four months. (2) Selected distinctly atheromatous subjects in whom cholesterol levels were of particular significance. The

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TABLE I
Dietetic Survey of Respective Lipids Intake (in grams per day)

Case No.	Lipids	Before Experiment	Average of 1st and 2nd Weeks	Average of 8th and 9th Weeks	Average of 18th Week
I	Total lipids.....	104.5	91.9	81.0	81.5
	Animal fats.....	63.0	54.2	37.3	49.3
	Vegetable fats.....	41.5	37.7	43.7	32.2
	including olive oil.....	0	34.5	31.0	29.0
II	Total lipids.....	85.5	97.6	104.2	69.5
	Animal fats.....	65.4	57.1	57.6	44.9
	Vegetable fats.....	20.1	40.5	46.6	24.6
	including olive oil.....	0	22.5	27.0	22.0
III	Total lipids.....	58.5	64.5	62.5	62.1
	Animal fats.....	33.0	39.3	40.0	32.1
	Vegetable fats.....	25.5	25.2	22.5	30.0
	including olive oil.....	0	20.0	22.5	30.0
IV	Total lipids.....	76.5	63.2	65.9	58.4
	Animal fats.....	54.5	31.2	30.9	30.9
	Vegetable fats.....	22.0	32.0	35.0	27.5
	including olive oil.....	0	32.0	35.0	27.5
V	Total lipids.....	100.4	91.7	76.3	79.7
	Animal fats.....	49.4	40.6	33.3	36.4
	Vegetable fats.....	51.0	51.1	43.0	43.4
	including olive oil.....	0	22.5	17.0	17.0
VII	Total lipids.....	74.3	63.8	68.0	82.4
	Animal fats.....	62.3	52.8	33.0	28.4
	Vegetable fats.....	12.0	31.0	35.0	54.0
	including olive oil.....	0	31.0	35.0	54.0
VIII	Total lipids.....	81.4	72.5	77.7	54.3
	Animal fats.....	64.0	50.2	49.6	32.0
	Vegetable fats.....	17.4	22.3	28.1	22.3
	including olive oil.....	0	22.3	27.0	18.0
X	Total lipids.....	68.6	45.0	43.7	...
	Animal fats.....	64.1	21.5	16.7	...
	Vegetable fats.....	4.5	23.5	27.0	...
	including olive oil.....	0	23.5	27.0	...

patients were treated in an ophthalmologic department for nondiabetic atheromatous retinitis. Through strict screening of the subjects, only those volunteer subjects whose seriousness and eagerness to cooperate left no doubt were selected. (3) Selected only ambulatory patients in order to approximate as closely as possible the conditions prevailing in preventive dietetics. (4) Used olive oil of well

defined properties and derived from the same lot during the entire course of the study, something which our predecessors do not mention. We used pure oil obtained by pressing, with the following chemical properties:*

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Oleic acidity	0.60%
Saturated fatty acids	19%
Unsaturated fatty acids	81%
Palmitic acid	17.2%
Oleic acid	65.9%
Stearic acid	<1%
Palmitoleic acid	1.8%
Linoleic acid	15.1%
Iodine number	85.2
Saponification value	196.2

In order to make sure that the subjects would actually consume the oil during the course of the study, we established a supply at the consultation office, from which they obtained their provisions. (5) Specified the kind of food consumed by the subjects during the fortnight preceding the beginning of the study and on three further occasions over a period of five weeks during the course of the investigation. These surveys (Table I) made it possible to ascertain the total quantity of fats ingested and the proportion of those of animal and of vegetable origin. A questionnaire was supplied to the consultants and the dietitian who checked them every fifteen days. (6) In order to approximate as closely as possible the conditions prevailing in actual life, we did not establish any definite dosage for oil consumption, leaving it to each subject to use as much as he pleased. We requested only that the oil be used to the exclusion of any other type of seasoning fat. (7) No other therapy capable of affecting lipid metabolism was concomitantly administered.

METHODS AND RESULTS

The following blood-level determinations were carried out: total lipids, with the respective proportion of alpha and beta lipoproteins;⁴ total cholesterol⁵ and cholesterol proportions in terms of the alpha and beta lipoprotein fractions;⁶ and the Kunkel phenol test.⁷ These quantitative determinations were carried out after a period of four months.*

* They were performed by Dr. Ghata from the department of Dr. Azerad at the Beaujon Hospital, whom we thank for their cooperation and help without which this study could not have been successfully concluded.

Table II lists the results obtained during this four-month period. It should be noted that our study was continued during the subsequent months; the subjects, while continuing to use olive oil as their sole seasoning lipid, somewhat relaxed their diet in a number of cases. In the thesis of one of us (M.D.)⁸ the reader will find details of the observations made during the first period of four months, the only one with which we are here concerned, as well as during the subsequent months.

Table I contains the results of the dietetic survey of our subjects. It shows that as soon as they used the oil, they generally cut down the ingestion of lipids, especially those of animal origin. A substantial reduction in the total lipid intake was noted.

On the other hand, we found (Table II) a general decrease in both total cholesterol and total lipids. Considering only the averages, we found a marked drop in the cholesterol level, averaging 49 mg. per 100 ml. in ten cases; the average level dropped from 344 to 295 mg. per 100 ml. This represents a decrease of 14.2 per cent.

The lipid level in seven subjects averaged 894 mg. per 100 ml. before the study and 661 mg. per 100 ml. after it, i.e., an average reduction of 233 mg. per 100 ml., which reflects the very appreciable percentage drop of 26 per cent. In three cases there was also a decrease in the beta lipoprotein fraction.

How are these results to be interpreted?

The reduction in the total amount of lipids consumed explains the drop in the cholesterol and lipid levels of the blood. Is it conceivable, however, that olive oil may have some intrinsic effects of its own? It would seem that the first factor is predominant, because in the second period, the detailed results of which are discussed by Demarne⁸ it was found that olive oil did not prevent a rise in the cholesterol levels of some subjects when their diet, under less strict supervision, was somewhat relaxed. At any rate, our study, which has the advantage of having been carried out in ambulatory patients, shows that the use of olive oil during four months did not interfere with the drop in the cholesterol and lipid levels of the blood,

TABLE II
Results of Blood Studies (Lipids and Cholesterol) Before and After Experiment

Case No.	Time	Total Lipids (mg. %)	Alpha Lipo-proteins (%)	Beta Lipo-proteins (%)	Total Cholesterol (mg. %)	Beta Cholesterol (%)	Alpha Cholesterol (%)	Kunkel Phenol Test
I	Before	562	23.2	76.8	304	77.6	22.4	...
	After	480	21.8	78.2	230	78.1	21.9	12.5
II	Before	640	35.0	65.0	282	76.9	23.1	...
	After	...	...	...	260	76.9	23.1	...
III	Before	992	14.1	85.9	400	83.3	16.7	38.0
	After	810	21.0	79.0	330	81.9	18.1	32.6
IV	Before	1,250	8.3	91.7	540	85.6	14.4	...
	After	990	10.6	89.4	460	92.2	7.8	35
V	Before	830	26.1	73.9	320	77.0	23.0	...
	After	591	32.2	67.8	260	76.8	23.2	13.5
VI	Before	710	20.0	80.0	284	92.6	7.4	...
	After	550	20.0	80.0	260	83.1	16.9	16.4
VII	Before	...	...	...	335	...	...	...
	After	645	32.5	67.5	325	72.0	28.0	20.8
VIII	Before	...	...	...	390	...	...	...
	After	640	31.4	68.6	320	62.6	37.4	...
IX	Before	1,230	20.3	79.7	290	61.0	39.0	32.0
	After	540	39.0	61.0	220	72.7	27.3	22.0
X	Before	685	37.2	62.8	297	57.8	42.2	38.0
	After	670	39.0	61.0	290	65.5	34.5	24.0

which were constantly checked under the experimental conditions of our study.

In this respect, therefore one can include olive oil among the cholesterol-reducing vegetable oils or, at the very least, among those without adverse effect on blood cholesterol. As a matter of fact, its chemical composition places it among the animal fats with a high content of saturated fatty acids and the oils containing highly unsaturated fatty acids, for it contains oleic acid, an unsaturated monoacid, and a still appreciable percentage of linoleic acid.

The effect of the physiologic properties of olive oil on hepatobiliary function constitutes a further argument in favor of greater dietetic utilization. Its therapeutic virtues, as one of

us has recalled,⁹ are valuable and real. It increases the secretion and excretion of bile by its choleric and cholecystokinetic action. This biliary action is important because it indirectly effects organic detoxication through the liver. And because of this activity, olive oil indirectly affects the excretion of cholesterol through the bile.

SUMMARY AND CONCLUSIONS

Ten subjects, exhibiting distinct stigmas of atheromatosis as evidenced by the presence of retinal lesions, were given pure olive oil as sole seasoning fat. The alimentary investigation generally reflected some resulting reduction in the level of lipids consumed, especially those of

animal origin. After four months, the lipid levels dropped an average of 26 per cent and the cholesterol levels 14.2 per cent.

These findings and the well established knowledge of the beneficial effects of olive oil on the hepatobiliary function suggest a wider use of this oil in prophylactic dietetics with a view to preventing high cholesterol and lipid blood levels.

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