

EFFECTS OF CHOLESTEROL-LOWERING DIETS ON THE RISK FOR CANCER AND
OTHER NON-CARDIOVASCULAR DISEASES

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INTRODUCTION

Concerns about the safety of cholesterol-lowering diets have been raised from early on. These have been reinforced by the discovery of an association between low serum cholesterol and cancer in a number of prospective studies. This brief review discusses the effect of cholesterol-lowering diets on the risk for cancer and for other non-cardiovascular diseases.

CANCER

Three questions should be distinguished, which, although they appear synonymous, are in fact independent:

1. Does a low serum cholesterol predict an increased risk of cancer?
2. Will cancer rates increase if a population adopts a cholesterol-lowering diet?
3. Does consumption of polyunsaturated fatty acids enhance cancer risk?

1. Individuals with low cholesterol

Within one population, a large range of serum cholesterol values is generally found. Differences in diet are too small to explain this variation. As an example, Table I shows the diets of subjects in the upper and lower 5% tail of the cholesterol distribution of 371 students in Wageningen. Although the dietary differences are in the expected direction, they are far too small to explain the difference in cholesterol values.

Also if differences in serum cholesterol between individuals were determined mainly by diet, then transferring subjects to one common diet should equalize their cholesterol levels. This is not what is seen in controlled trials; subjects with high free-living levels remain high, and those with low levels remain low, though the range does become smaller.

Thus within one population subjects have low or high cholesterol values primarily because of differences in metabolism not diet.

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TABLE I

DIETS OF STUDENTS WITH CHOLESTEROL VALUES IN THE LOWER AND UPPER FIFTH PERCENTILE OF THE SERUM CHOLESTEROL DISTRIBUTION (1)
Diets were assessed in 371 students by a two- or three-day weighed record. Cholesterol values were the mean of two determinations.

	Serum Cholesterol	
	Bottom 5%	Top 5%
Number of students	18	21
Serum cholesterol (mmol/l)	<3.3	>6.0
(mg/dl)	<128	>230
Saturated fatty acids (% of energy)	14	15
Polyunsaturated f.a. (% of energy)	6	5
Cholesterol (mg/10 MJ*)	200	300
Pectin (g/10 MJ*)	3.4	2.8

* 10 MJ = 2400 kcal

2. Populations eating cholesterol-lowering diets

When serum cholesterol values are averaged over a population, then the metabolic idiosyncrasies of individuals average out. The population mean that results will be determined by the dietary habits that are typical for the population in question and that influence the serum cholesterol level of all of its members.

Thus in the Seven Countries Study (2) the Finnish men had a mean cholesterol of 260 mg/dl (6.7 mmol/l) and the Japanese of 145 mg/dl (3.7 mmol/l). The difference is caused by the Japanese eating much less saturated fat (and cholesterol).

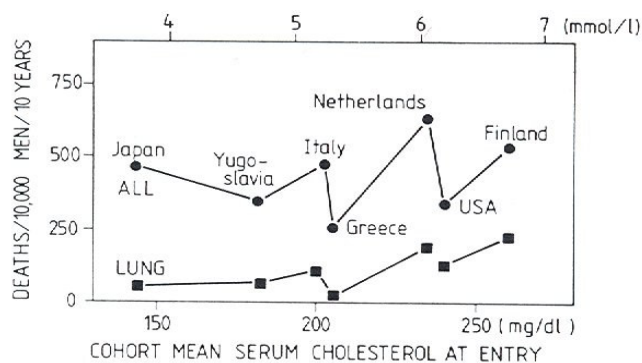


Fig. 1. Mean serum cholesterol at entry of men then aged 40-59 years, and relative number of men dead from cancer 6-15 years after entry. Upper curve: all cancers; lower curve: lung cancer.

If eating a cholesterol-lowering diet enhances cancer risk, then the Japanese should have much more cancer than the Finns. Fig. 1 shows that they did not. The extreme differences in dietary habits between the men in the seven countries caused extreme differences in serum cholesterol and in heart disease mortality, but not in cancer mortality.

Almost 90% of the Japanese men had a cholesterol below 170 mg/dl, which is an extremely low value by Northern European or US standards, but their cancer risk was not higher than that of the Northern European or American men. On the other hand, the 3.5% of the men from the Netherlands, Finland and the USA who had a cholesterol below 170 mg/dl had a cancer risk almost twice as high as the means for their countries (2). These men had a cholesterol as low as that of the men from Japan and the Mediterranean. However, the low cholesterol in this 3.5% was probably not caused by diet, but by some metabolic idiosyncrasy. These men thus had a cholesterol level that was low for the diet eaten. I suggest that this is a mark of something in the subject's metabolism that makes him prone towards cancer, and that the number of people with this propensity will remain the same when cholesterol values throughout a population are shifted down by a change of diet. In that case, population-wide adoption of cholesterol-lowering diets would not change cancer rates.

3. Dietary polyunsaturates and cancer

Some observations that bear on the safety of polyunsaturates are discussed below.

Epidemiological data. The intake of polyunsaturated fatty acids in the USA has risen from about 4% of energy in 1960 to 6-7% at present. As a result, the proportion of linoleic acid in the body fat of Americans has gone up from 9% to about 15% (3). There are no indications that this change in dietary habits has been followed by an increase in cancer mortality. The age-adjusted death rate from colon cancer in men aged 45-64 years was rising slowly long before 1960, and it levelled off around 1976. Colon cancer mortality in US women has been coming down since before 1950. Gastric and rectal cancer have been decreasing steeply in both sexes, and age-adjusted breast cancer mortality has been steady over the last 20 years. Thus the effect of the increased polyunsaturate intake on US cancer rates is either very much delayed, or it does not exist.

Controlled trials. The Veterans' Administration Trial showed an excess mortality from cancer in the high-polyunsaturate group. This effect was, however, not reproduced in subsequent controlled dietary trials, most of which employed marked increases in polyunsaturate intake.

Animal experiments. The growth of chemically induced or transplanted tumors in rats is slowed if the intake of polyunsaturates falls below 3% of energy. Above that threshold, increased intake of polyunsaturates no longer influences tumor growth. The debate in man centers on whether doubling polyunsaturate intake from 5% of the energy - the present level - to 10% of energy would increase cancer risk. The animal data suggest that it would not.

DISEASES OTHER THAN CANCER

Deficiencies of trace elements and vitamins pose a potential problem if whole classes of foodstuffs such as meat, dairy products and eggs should be eliminated from the diet. In fact there is no need for eliminating these foods. Milk, yoghurt and red meat can be produced with a low fat content. Eggs and liver will always be high in cholesterol, but they are also good sources for a wide variety of nutrients; a moderate intake should be recommended.

A common feature of most cholesterol-lowering diets is restriction of fat and increase of carbohydrate intake. If the carbohydrates are provided by fibre-rich foods such as beans and whole-grain products then constipation will be reduced. This is a minor illness, but it is widespread and causes a large consumption of drugs and medical services. The frequency of other diseases of colon and rectum such as diverticulitis and spastic colon might also be reduced. High fibre diets could also improve glucose tolerance in diabetes.

Mass adoption of high carbohydrate diets may cause an increase in sugar intake and thus in dental caries. Nutrition educators should realize that there is a potential conflict: replacement of cheese as a snack by raisins is better for the coronary arteries but not for the teeth. Better oral hygiene and fluoride use can, however, largely eliminate caries.

Obesity is associated with consumption of high-fat diets, and theoretically the obese might benefit from the low-fat diets advocated for lowering cholesterol. Whether this benefit will materialize remains to be seen, because obesity is highly resistant to treatment.

Finally, there are indications that reduction of total and saturated fat intake and increased consumption of polyunsaturates will reduce hypertension.

CONCLUSIONS

Consumption of cholesterol-lowering diets will reduce coronary risk. The effect of such diets on cancer risk in man is probably small. A fat-restricted high-fibre diet may provide added benefits for a number of other non-infectious diseases, except caries.

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