

Dietary Fat and Its Relation to Heart Attacks and Strokes

REPORT BY THE CENTRAL COMMITTEE FOR MEDICAL AND COMMUNITY

PROGRAM OF THE AMERICAN HEART ASSOCIATION*

CURRENT available knowledge is sufficient to warrant a general statement regarding the relation of diet to the possible prevention of atherosclerosis (Appendix I).

A heart attack, also called coronary thrombosis or myocardial infarction, or just plain "coronary," is almost always caused by atherosclerosis (arteriosclerosis or hardening of the arteries). Stroke, or apoplexy, is often caused by the same condition. The problem of preventing or retarding these diseases is, then, one of preventing or retarding atherosclerosis.

How Does Atherosclerosis Develop?

Atherosclerosis is a complex disease of the arteries. It is known that a number of factors influence or are related to its development. Among these factors are a high content in the blood of a type of fat called cholesterol, elevation of blood pressure above normal, presence of diabetes, obesity, and a habit of excessive cigarette smoking. Age, sex and heredity are also important.

What Types of Research Relate Diet to Atherosclerosis?

Many years ago a scientist fed cholesterol and other types of fat to rabbits. The blood cholesterol content increased and the rabbits developed atherosclerosis; that is, cholesterol and other fatty substances were deposited in the walls of the arteries. Many other animal species have been found to behave similarly. These animal experiments indicate that diet may be an important cause of atherosclerosis.

Global studies have shown that dietary habits of human populations differ. Evidence gathered from many countries suggests a relationship between the amount and type of

fat consumed, the amount of cholesterol in the blood and the reported incidence of coronary artery disease.

Study of diets in the United States indicates that they usually contain large amounts of fat which account for approximately 40-45 per cent of the calories. In contrast, many populations in other parts of the world—for example, large groups in Asia, Africa and Latin America—eat food containing barely a third as much fat. The concentrations of cholesterol in the blood of such groups are much less than in those consuming the excess calorie and high-fat diets, and some reports indicate that heart attacks are correspondingly fewer. There are other differences in these diets that may also be of importance, such as the amount and type of protein and carbohydrate.

These and other research studies have given clues to the prevention of atherosclerosis by dietary means. A reduction in blood cholesterol by dietary means, which also emphasizes weight control, may lessen the development or extension of atherosclerosis and hence the risk of heart attacks or strokes. It must be emphasized that there is as yet no final proof that heart attacks or strokes will be prevented by such measures.

What Measures Reduce the Amount of Cholesterol in Blood?

Several ways of reducing blood cholesterol concentration are being studied at the present time. This discussion is limited to the modification of diet.

The amount of cholesterol in blood usually reflects the concentration of other fatty substances in the blood as well. If cholesterol is reduced, other fats in the blood usually decrease.

Several methods designed to reduce the amount of cholesterol in the blood have been suggested.

*The Central Committee for Medical and Community Program is the senior medical body of the American Heart Association and is chaired by A. Carlton Ernstene, M.D., of Cleveland, Ohio.

First, it would seem that the simplest way to reduce cholesterol in the blood is to eat less foods containing cholesterol. The problem is much more complex. If the amount of cholesterol in the diet is markedly decreased, but the caloric intake kept constant, the body may make more cholesterol from other substances, chiefly from other types of fat, sometimes nearly enough to make up for that which has been removed from the diet.

Second, reduction of the total caloric intake, by decreasing the amount of ordinary fat in the diet, usually causes reduction of the blood cholesterol concentration. Avoidance of excess fat in the diet also helps avoid obesity because one gram of fat provides 9 Calories, while one gram of protein or carbohydrate provides only 4 Calories. This does not mean that unlimited amounts of carbohydrate and protein should be eaten, for these, in excess, also lead to obesity and may also increase the level of cholesterol in the blood.

Third, the blood cholesterol concentration may also be reduced by controlling the amount and type of fat in the diet without altering caloric intake. Not all fats in the diet have the same effect on the amount of cholesterol in the blood. In the usual diet eaten in the United States, a large part of the fat is of the saturated type (Appendix II). Too much of this type of fat tends to increase the cholesterol in the blood. Considerable amounts of saturated fat are present in whole milk, cream, butter, cheese and meat. Coconut oil and the fat in chocolate also have a high content of fats of the saturated type. Most shortenings and margarines have less than half as much saturated fat, and the common vegetable oils have still less. When the intake of saturated fats is reduced, blood cholesterol levels usually decrease.

In contrast to the above food fats, many natural vegetable oils, such as corn, cotton and soya, as well as the fat of fish, are relatively low in saturated fats and high in fats of the poly-unsaturated type (Appendix II). When these fats are substituted for a substantial part of the saturated fats without increasing calories, blood cholesterol decreases. Finally, some food fats, such as olive oil, are

more or less intermediate in saturation and have no strong effect one way or the other on the blood cholesterol.

These measures make it possible to attempt a considerable alteration in the cholesterol level in the blood with the use of acceptable diets.

Who in Particular Should Modify the Fat Content of His Diet?

A) Most persons in the United States who are overweight will find it profitable to reduce their total caloric intake. Reducing the amount of fat in the diet is one way to do this. In addition to the possibility that atherosclerosis will be prevented, obesity will certainly be controlled. Regular, moderate exercise, exemplified by walking, is also desirable.

B) Men with a strong family history of atherosclerotic heart or blood vessel disease, who have elevated blood cholesterol levels, an increase in blood pressure, are overweight and/or who lead sedentary lives of relentless frustration should consider modifying their diets. A diet moderate in calories and fat (about 25-35 per cent of total calories from fat) may be helpful for these coronary-prone persons. Substitution of poly-unsaturated for a substantial part of the saturated fat in the diet may also be a valuable addition to this program.

C) Those people who have had one or more atherosclerotic heart attacks or strokes may reduce the possibility of recurrences by such a change in diet.

It should be borne in mind that moderate amounts of fat, particularly those containing an appreciable quantity of the poly-unsaturated type, are necessary for good health. Fat is an economical, and in limited amounts, a wholesome food. Food faddism of any sort should be avoided and significant changes in diet should not be undertaken without medical advice.

In Conclusion

The reduction or control of fat consumption under medical supervision, with reasonable substitution of poly-unsaturated for saturated

fats, is recommended as a possible means of preventing atherosclerosis and decreasing the risk of heart attacks and strokes. This recommendation is based on the best scientific information available at the present time.

More complete information must be obtained before final conclusions can be reached. Such information can be obtained only through intensified research into the causes and prevention of atherosclerosis—a program to which the American Heart Association is fully dedicated.

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*The Ad Hoc Committee on Dietary Fat and Atherosclerosis reported to the Central Committee for Medical and Community Program of the Association.

Appendix I

List of Recent Scientific References on Dietary Fat and Atherosclerosis

- AHRENS, E. H., JR., INSULL, W., JR., BLOMSTRAND, R., HIRSCH, J., TSALTAS, T. T., AND PETERSON, M. L.: Influence of dietary fats on serum-lipid levels in man. *Lancet* 1: 943, 1957.
- BROWN, H. B., AND PAGE, I. H.: Lowering blood lipid levels by changing food patterns. *J.A.M.A.* 168: 1989, 1958.
- BUECHLEY, R. W., DRAKE, R. M., AND BRESLOW, L.: Relationship of amount of cigarette smoking to coronary heart disease mortality rates in man. *Circulation* 18: 1085, 1958.
- GERTLER, M. M., WOODBURY, M. A., GOTTSCH, L. G., WHITE, P. D., AND RUSK, H. A.: The candidate for coronary heart disease: Discriminating power of biochemical, hereditary and anthropometric measurements. *J.A.M.A.* 170: 149, 1959.
- JOLLIFFE, N., RINZLER, S. H., AND ARCHER, M.: Anti-Coronary Club: including a discussion of effects of a prudent diet on serum cholesterol level of middle-aged men. *Am. J. Clin. Nutrition* 7: 451, 1959.
- KATZ, L. N., STAMLER, J., AND PICK, R.: *Nutrition and Atherosclerosis*. Philadelphia, Lea and Febiger, 1958.
- KEYS, A.: Epidemiologic aspects of coronary artery disease. *J. Chron. Dis.* 6: 552, 1957.
- KEYS, A., ANDERSON, J. T., AND GRANDE, F.: "Essential" fatty acids, degree of unsaturation and effect of corn (maize) oil on serum-cholesterol level in man. *Lancet* 1: 66, 1957.
- KINSELL, L. W., MICHAELS, G. D., WALKER, G., WHEELER, P., SPLITTER, S., AND FLYNN, P.: Dietary linoleic acid and linoleate: Effects in diabetic and nondiabetic subjects with and without vascular disease. *Diabetes* 8: 179, 1959.
- MCCANN, M. B., TRULSON, M. F., WADDELL, W. R., DALRYMPLE, W., AND STARE, F. J.: Effects of various vegetable oils on serum lipids of adult American males. *Am. J. Clin. Nutrition* 7: 35, 1959.
- Measuring the Risk of Coronary Heart Disease in Adult Population Groups: A Symposium. *Am. J. Pub. Health* 47: No. 4, Pt. 2, 1957.
- PAGE, I. H.: Atherosclerosis—a commentary. *Fed. Proc.* 18: No. 2, Pt. II, 47, 1959.
- PAGE, I. H., ed.: *Chemistry of Lipides as Related to Atherosclerosis: A Symposium*. Springfield, Ill., Charles C Thomas, 1958.
- PELL, S., AND D'ALONZO, C. A.: Diabetes mellitus in an employed population. *J.A.M.A.* 172: 1000, 1960.
- PILKINGTON, T. R. E., STAFFORD, J. L., HANKIN, V. S., SIMMONDS, F. M., AND KOERSELMAN, H. B.: Practical diets for lowering serum lipids: A long-term study on out-patients with ischaemic heart disease. *Brit. M. J.* 1: 23, 1960.
- PINCUS, G., ed.: *Hormones and Atherosclerosis: Proceedings of a Conference*. New York, Academic Press, 1959.
- POLLACK, H., CONSOLAZIO, C. F., AND ISAAC, G. J.: Metabolic demands as a factor in weight control. *J.A.M.A.* 167: 216, 1958.
- PORTMAN, O. W., AND STARE, F. J.: Dietary regulation of serum cholesterol levels. *Physiol. Rev.* 39: 407, 1959.
- STAMLER, J.: Epidemiology of atherosclerotic coronary heart disease. *Postgrad. Med.* 25: 685, 1959.

20. STARE, F. J., VAN ITALLIE, T. B., McCANN, M. B., AND PORTMAN, I. W.: Nutritional studies relating to serum lipids and atherosclerosis: Therapeutic implications. *J.A.M.A.* **164**: 1920, 1957.
21. Symposium on Significance of Lowered Cholesterol Levels. *J.A.M.A.* **170**: 2198, 1959.
22. WELLS, O. V.: Current food trends. *Nutrition Rev.* **17**: 161, 1959.
23. WHITE, P. D.: Atheroma and thrombosis: Major threats to our health today. Lyman Duff Memorial Lecture, Council on Arteriosclerosis, American Heart Association, American Society for the Study of Arteriosclerosis, Nov. 8, 1959. *Circulation* **21**: 1065, 1960.

Appendix II

Different Kinds of Fat in the Diet

Food fats and oils are made up of substances called fatty acids which are chemically combined with glycerol. In general, there are three different kinds of fats in our diet. These are called saturated, mono-unsaturated, and poly-unsaturated fats. All three types are usually present in any single food fat though in widely varying proportions. Thus, butter has about 55 per cent of saturated acids, 33 per cent mono-unsaturated acids, and 4 per cent poly-unsaturated acids. Corn, cottonseed, or soya oils contain in the range of 10-25 per cent saturated, about 25 per cent mono-unsaturated, and about 55 per cent poly-unsaturated fatty acids.

Not all fats in the diet have the same effect on the amount of cholesterol in the blood. Those high in saturated fat tend to increase the cholesterol in the blood, those high in mono-unsaturated acids have little effect, and those high in poly-unsaturated fats may cause a decrease. With vegetable oils this decrease is thought to be due largely to a poly-unsaturated fatty acid known as linoleic acid, and with certain fish oils to a variety of other poly-unsaturated fatty acids.

In the typical diet in the United States, a substantial part of the fat contains high levels of saturated fat—the fat in whole milk, cream, butter, cheese and meat. Coconut oil and the fat in chocolate are also high in saturated acids. Most of these fats are also low in poly-unsaturated fats. Most shortenings

and margarines have less than half as much saturated fat and the common vegetable oils have still less saturated fat. Mono-unsaturated fat is present in appreciable amounts in most dietary fat. Poly-unsaturated fat is highest in the nonhydrogenated liquid vegetable oils; next in the lightly hydrogenated vegetable oils; then in margarines, shortenings, and lard; and is lowest in beef and dairy fat.

A considerable quantity of the fats and oils consumed in the United States are of the hydrogenated type. These fats and oils vary considerably in fatty acid composition depending on the extent of hydrogenation, a processing of the fat which retards the development of rancidity and can be used to convert liquid fats to a semi-solid or solid consistency. Hydrogenation also decreases the amount of poly-unsaturated fats depending on the extent of hydrogenation. Most of the solid margarines and shortenings made in this country by the process of hydrogenation are moderate in their saturated fat content and they are generally low in poly-unsaturated fats (10-15 per cent) though not as low as beef and dairy fat (2-4 per cent). It might be well for the manufacturers of fats and oils to indicate for the consumer by label declaration the approximate fatty acid composition of the final product in terms of the three main types of food fats—saturated, mono-unsaturated and poly-unsaturated.

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