

## A GUIDE FOR DIETARY REDUCTION OF SERUM CHOLESTEROL LEVEL IN PATIENTS WITH HYPERLIPEMIA

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THE dilemma of the practitioner in choosing a satisfactory method of controlling blood lipids is illustrated by Dr. Philip L. White<sup>1</sup> in his introduction to the *Symposium on Significance of Lowered Cholesterol Levels*: "Pressure from the patients and their families, pressure from the promoters of certain drugs, and his own determination to apply the most beneficial measures to these patients have left the physician in a frustrating position." One member of the panel suggests that patients and their families should rely on the "informed individual physician," but, through no fault of his own, the individual physician is often not informed. Out of the welter of suggestions for reducing blood lipids, he often finds the dietary approach the most practical.

It is true we cannot speak conclusively about the dietary factors influencing serum lipids, the optimum proportion of nutrients, the chemical characteristics of fats causing serum lipid changes, or the long-term benefits of treatment. However, we are currently justified in using the knowledge obtained from well-controlled dietary experiments to reduce the patient's blood cholesterol.

Let us follow a hypothetical patient with evidence of atherosclerotic disease. We first make sure he is a good candidate for dietary treatment. We rule out conditions that temporarily alter serum cholesterol level. Weight loss, diarrhea, fever, and medications such as desiccated thyroid, estrogens, nicotinic acid, or sitosterol reduce serum cholesterol levels temporarily; whereas rapid weight gain, cortisone, testosterone, or corticotropin (ACTH) raise it. He is not on a self-imposed diet, another possible factor influencing serum lipid levels. We find his serum cholesterol concentration is in the neighborhood of 375 mg. per 100 ml. on two separate occasions. He eats in restaurants only occasionally; he has a concerned and co-operative wife; he takes his own lunch to work, or eats lunch regularly at one restaurant where his special needs will be met. This patient is a good candidate for dietary instruction and treatment.

It is useless and even harmful, to the patient's morale, to prescribe a diet that he cannot follow within his established daily routine. The traveling man who eats most of his meals in hotels and restaurants cannot adhere to food restrictions, however co-operative he may be. Others may be psychologically unable to accept new food patterns, or their living situations may be such that the suggested changes would do more harm than good.

What food pattern should be prescribed? The physician has two choices for this patient, either of which changes the accustomed fat yet supplies all essential nutrients.<sup>2</sup> The *low-fat* diet limits *all fats* to 13 per cent of total calories. For

example, in a 2000-calorie low-fat diet, 15 gm. of animal fat is allowed, and 15 gm. from other sources, mainly margarine at the table and hydrogenated shortening in cooking. The other choice is the *vegetable-oil* diet in which total fat remains at the average American level of 40 per cent of the calories; vegetable oils are substituted for the usual animal and hydrogenated fats. The vegetable-oil food pattern supplying 2000 calories contains 15 gm. of animal fat as in the low-fat diet and, in addition, 75 gm. of fat from vegetable oils.

The choice between the low-fat and the vegetable-oil food patterns usually depends upon which is more adaptable to the patient and his living habits. In general, the serum cholesterol levels are lower and more stable with the vegetable-oil food pattern. For example, on the low-fat diet, occasional fatty foods cause a considerable rise in serum cholesterol level, but a five-day vacation from vegetable oil brings about only a minor change. However, as indicated below, a few patients have a lower cholesterol level on the low-fat diet than on the vegetable-oil diet. When weight reduction is necessary, the low-fat diet may be prescribed at first, and when appropriate weight is attained, the patient then may change to the vegetable-oil diet. Most patients, after a time, find the low-fat regimen rigorous. The vegetable-oil food pattern is closer to the ordinary American bill of fare, affording variety, palatability, and satisfaction.

In both food patterns, animal fat is eliminated by avoiding butterfat, by using egg yolks only occasionally in simple desserts, by cooking with the minimum of fat, by selecting low-fat foods, and by choosing lean meat, fish, and poultry. Lean meat is easily recognized by its lack of marbling. Visible fat is trimmed before cooking, and the liquid fat is drained off during cooking. No particular attempt is made to reduce the cholesterol content of the foods.

The vegetable-oil food pattern requires not only reduction of all animal fat, as in the low-fat diet, but, in addition, substitution of vegetable oil for the usual hard fats, five to seven times as much oil as animal fat. In practical terms, the amount of vegetable oil varies from 4 to 7 tablespoonfuls a day, depending on the caloric requirement. A useful rule of thumb is to prescribe 4 or 5 tablespoonfuls for a sedentary adult, 6 or 7 tablespoonfuls for large and active persons. Cottonseed, corn, peanut, soybean oils are all suitable. The oil should not be taken as a medicine, but can be combined in foods in many ways: as a nonhydrogenated spread, salad dressing, seasoning for vegetables and meats, in sauces, and as shortening in breads, cakes, cookies, and pies.

For reduction of serum cholesterol, it is most important to limit all kinds of fat, *including vegetable oils*, in the low-fat diet. In the vegetable-oil diet, there must be a considerable *excess of vegetable oil*. These relationships<sup>3</sup> must be held firmly in mind. What happens when 30 gm. of an unsaturated oil preparation is taken in addition to freely chosen foods? Animal and hydrogenated fats are still in excess of oil. When 30 gm. of an oil preparation is added to the low-fat diet, a common practice at the present time, the resulting diet will have 60 gm. of fat, so it is no

longer low in fat, yet it is not high enough in vegetable oil to be effective in reducing serum cholesterol levels.

What sort of serum cholesterol change can be expected in this patient with dietary treatment over a year's time? The answer depends upon his type of hyperlipemia.<sup>4</sup> There are three different types. The first is the commonly accepted hyperlipemia that we prefer to call *hyperglyceridemia*, a more exact, descriptive term; the second is the commonly recognized *hypercholesteremia*; the third is a recently described<sup>4</sup> category we have called *mixed hyperlipemia*. These serum lipid abnormalities are characterized by variations in relationship between the serum cholesterol, triglycerides, and phospholipids. Serum cholesterol concentration in all three types is elevated above normal. In hyperglyceridemia, the triglyceride fraction is much higher than cholesterol and phospholipid fractions. In hypercholesteremia, cholesterol is high out of all proportion to the triglyceride and phospholipid fractions. In mixed hyperlipemia, cholesterol, triglyceride, and phospholipid all are high, but in normal proportions to each other.

How can a physician tell what serum lipid abnormality the patient has without a great many laboratory tests? Determinations of cholesterol and lipid phosphorus with visual examination of a fasting sample are usually sufficient to distinguish among the three types of hyperlipemia. In hyperglyceridemia, serum is usually milky, the total cholesterol to phospholipid ratio is normal, less than 1.0, while in hypercholesteremia, serum is clear, and the total cholesterol to phospholipid ratio is high, greater than 1.2. In mixed hyperlipemia, serum is clear or somewhat opalescent, and the proportion of cholesterol to phospholipid is 1.0 or less.

The three types of hyperlipemia differ in ways other than in the lipid pattern. In hyperglyceridemia, the serum cholesterol level is changeable; cholesterol concentration varies as much as 100 to 200 mg. per 100 ml. from one time to another for no apparent reason. In hypercholesteremia, serum cholesterol is stable, even when there is rapid weight gain. One patient who gained 20 pounds in less than two months had no more than 10 mg. of difference in cholesterol levels. In mixed hyperlipemia, serum cholesterol levels vary normally,  $\pm 25$  mg. per 100 ml. in a year.

The three types of hyperlipemia differ in their responses to dietary treatment. In patients with hyperglyceridemia who follow the low-fat diet, serum cholesterol levels become nearly normal, but remain highly variable. Cholesterol usually is lowered and more stable on the vegetable-oil food pattern. Vegetable-oil is the preferable food pattern for patients of this group, except for a few who have lower serum cholesterol levels on the low-fat diet. In hypercholesteremia, serum cholesterol may be reduced by either diet, though in many patients it will not fall below 350 mg. per 100 ml. In other patients, serum cholesterol drops to 300 mg. or less per 100 ml., but may revert to higher levels after from three to six months of dietary treatment. Patients with hypercholesteremia require treatment other than diet to attain a normal serum cholesterol concentration; as yet, no

such treatment has been found. For some patients, the vegetable-oil diet elicits a lower serum cholesterol level than does the low-fat diet. In patients with mixed hyperlipemia, serum cholesterol levels decrease readily with the use of either food pattern, and remain normal for as long as they remain on the diet. Some of them, in our experience, have maintained normal serum cholesterol levels for more than two years.

Differences of opinion will arise as to the value of dietary treatment of elevated serum cholesterol levels, unless the types of lipid abnormality are taken into consideration and an adequate food pattern is employed. When treating this hypothetical patient for a reduction of a high serum cholesterol level by changing his food pattern, two questions must be asked: What type of hyperlipemia does he have? What food pattern will be most effective for him? Failure to ask these questions—and to find the right answers—is often responsible for the physician's discouragement with dietary management of hyperlipemia.

#### References

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