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ABSTRACT

Nutrition is well-recognized as a necessary component of educational programs for physicians. This is to be valued in that of all factors affecting health in the United States, none is more important than nutrition. This can be argued from various perspectives, including health promotion, disease prevention, and therapeutic management. In all cases, serious consideration of nutrition related issues in the practice is seen to be one means to achieve cost-effective medical care. These modules were developed to provide more practical knowledge to health care providers, and in particular primary care physicians. This module is designed to help physicians to instruct patients with hyperlipidemia in the selection, purchase, and preparation of foods according to an individualized dietary regimen. Also covered is nutritional assessment for the hyperlipidemic patient. Included are learning goals and objectives, self-checks of achievement with regard to goals, and references for the physician and for the physician to give to the patient. The appendices including a list of low-cholesterol, low-saturated fat, low-simple sugar foods, and a sample menu. (CW)

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The Nutrition in Primary Care Series Contains These Modules:

1. Nutrient Content of Foods, Nutritional Supplements, and Food Fallacies
2. Appraisal of Nutritional Status
3. Nutrient and Drug Interactions
4. Normal Diet: Age of Dependency
5. Normal Diet: Age of Parental Control
6. Normal Diet: Adolescence
7. Normal Diet: Pregnancy and Lactation
8. Normal Diet: Geriatrics
9. Dietary Management in Obesity
10. Dietary Management in Diabetes Mellitus
11. Dietary Management in Hypertension
12. Dietary Management in Hyperlipidemia
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Nutrition in Primary Care

Tables

Introduction

In the United States, cardiovascular disease is the major cause of death. The latest statistics indicate that over half of the deaths occurring per year result from cardiovascular diseases In 1976, coronary heart disease alone was responsible for 34% of all deaths. The remainder included a large number of deaths from stroke and peripheral vascular disease. The fact that 25% of all cardiovascular deaths occurred in persons less than 65 years of age indicates that heart disease is not limited to the elderly.

Through epidemiological research, several risk factors have been found to correlate significantly with death rate from coronary heart disease; the three major risk factors are hypercholesterolemia, hypertension, and cigarette smoking. Patients with diabetes mellitus have a significantly higher rate of coronary heart disease than do non-diabetics. Physical activity is a risk factor amenable to change. Risk factors that are difficult, if not impossible, to change include personality, heredity, age, sex, and changing life patterns.

Goals

Although there is little hard evidence that lowering serum lipid levels by dietary manipulation or drug therapy will protect against atherosclerosis or decrease morbidity and mortality from coronary heart disease, you may have hyperlipidemic patients for whom you feel dietary manipulation is important. The content of this module should help you instruct patients in the selection, purchase, and preparation of appropriate foods according to an individualized dietary regimen.

As a result of this unit of study, you should be able to:

1. *Identify those patients with hyperlipidemia for whom dietary modifications may be indicated;*

2. *Prescribe the appropriate dietary modifications for hyperlipidemic patients; and*

3. *Instruct patients on needed dietary modifications in a way that they can change their behavior to comply with these recommendations.*

Risk Factors as Predictors of Coronary Heart Disease

Several risk factors have been found to correlate significantly with coronary heart disease. Although it is not possible to predict with confidence whether or not or when a person will have a heart attack, it is possible to classify an individual as being of low, average, or high risk. The methods for making such classifications include: noting personal habits, family history, and personality, and doing a physical examination and laboratory tests.

Several epidemiological studies have cited factors which correlate well with coronary heart disease,[1-10] perhaps the most famous being the Framingham Study.[15] Identification of risk factors for coronary heart disease can be classified into five categories: personal habits, family history, personality, physical examination, and laboratory tests.[12]

Personal Habits

Personal habits that may be associated with coronary heart disease include restlessness, nervousness, cigarette smoking, heavy alcohol consumption, and a sedentary lifestyle. There is increasing evidence that more than two alcoholic drinks may elevate plasma lipids and decrease the stroke volume of the heart of a patient with coronary heart disease, thereby reducing exercise tolerance. On the other hand, moderate use of alcoholic beverages may be protective against atherosclerosis by increasing the serum high-density lipoprotein (HDL) fraction.

Family History

Age of onset of coronary heart disease is valuable information; the younger the age of onset (particularly before age 40), the more likely the disease is to be familial than if onset occurs after age 65 to 70. If patients relate a family history of coronary heart disease in both parents, aunts, uncles, cousins, or siblings, their chances of developing the disease greatly increase, unless the manifestations of coronary heart disease in family members occurred after age 65 to 70. If a patient 30 years old or less has had a heart attack, and another family member had a heart attack when below the age of 40, you should suspect an inherited lipoprotein defect, probably Type II hyperlipidemia based on the Frederickson classification.

Personality

Although these risk factors are difficult to define and evaluate, many researchers believe heart disease is related to overwork, stress, and discontentment. Medical opinion is sharply divided on the relationship of personality and coronary heart disease. Friedman and his colleagues believe people can be divided into one of two personality types. Type A individuals, who may be the higher risk for coronary heart disease, are classified as competitive, restless, driving, impatient, and ambitious, and may feel discontented with their level of achievement, often regarding themselves as failures. Type B persons have opposite personality traits.

Studies have indicated that recent severe life changes may have a precipitating effect on myocardial infarctions and death.[13] In 1967, Holmes[30] developed a social readjustment rating scale to quantitate a person's life changes over the last twelve months of life in an attempt to ascertain the patient's susceptibility to illness. Smith, et al.[31] have recently discussed Holmes's work and the importance of these concepts for family physicians.

Physical Examination

Although it is not the intent in this module to list and discuss all of the examination criteria typical of coronary heart disease patients, the following examination findings may be indicative of premature atherosclerosis:

- Premature bitemporal grayness of the hair in men.
- Appearance of arcus senilis or arcus corneae in young persons.
- Cholesterol deposition in the soft tissues surrounding the eye.
- Tuberous deposits in the skin and tendons.

- Retinal vessel changes.
- Elevated arterial blood pressure.
- Left ventricular hypertrophy.
- Peripheral vascular disease.
- Obesity.
- Diabetes mellitus.

Laboratory Tests

The cholesterol and triglyceride concentrations in the plasma or serum determine whether or not hyperlipidemia is present. Fasting samples are used to measure blood glucose and triglyceride levels, although fasting is not necessary for cholesterol levels. A good screening test would be one fasting blood sample for all three laboratory tests. If the resulting supernatant for the lipid tests is cloudy following an overnight refrigeration, this generally indicates an increased concentration of triglycerides carried by very low-density lipoproteins (VLDL), or pre-beta lipoproteins. If the supernatant is clear, the VLDLs are generally normal. If after an overnight setting there is a "cream-like layer" at the top of the plasma, one would suspect hyperchylomicronemia, Type I hyperlipidemia, or Type V mixed hyperlipidemia, suggesting a decrease of, or defect in lipoprotein lipase.

When you find a patient with elevated plasma cholesterol or triglyceride levels, ask to have the test repeated to rule out laboratory error and also consider a lipoprotein electrophoresis which provides a separation of the four major lipoprotein bands. A lipoprotein electrophoresis test is not always necessary, however. The interpretation of the results of the electrophoretic test will indicate the type of hyperlipidemia the patient has. A word of caution: because 75% of all coronary deaths in the United States occur in patients with so-called "normal plasma lipids," we ought to be questioning the validity of "average" or "normal" blood lipid values — perhaps they should be lowered. Epidemiological data suggest that persons who have cholesterol levels above 220 mg/dl or triglyceride levels above 120 mg/dl have a greater risk o developing atherosclerotic lesions than those with values below these levels. The greater the rise above these levels, the greater the risk of developing coronary heart disease.[12]

Measurement of the amount of the various lipoprotein fractions is of importance to physicians and nutritionists. It has been suggested that a high amount of low-density lipoproteins is harmful, whereas a high amount of high-density lipoproteins is protective against coronary heart disease. There appears to be a highly significant correlation between the presence of high-density lipoproteins (HDLs) in the circulatory system and the absence of coronary heart disease. HDLs have been shown to increase in persons following weight loss. HDLs are higher in marathon runners than in sedentary men, in moderate alcohol users than in heavy drinkers, in Eskimos (despite their high fat intake) than in other groups, and in premenopausal women than in postmenopausal women.

Another important laboratory test in diagnosing hyperlipidemia is carbohydrate tolerance. Fasting blood sugar levels greater than 100 mg/dl should be considered as evidence for high risk to the development of coronary heart disease. Elevated levels of serum uric acid, immunoreactive insulin, hemoglobin, and hematocrit may be associated with increased risk for coronary heart disease. Physiological tests of significance in diagnosing heart disease include abnormal electrocardiogram readings and poor performance when function of the heart under a workload is measured (treadmill testing).

The Frederickson Classification of Hyperlipidemia

According to the Frederickson classification, five types of hyperlipidemia have been identified. Each type is characterized by its own elevated blood lipids and elevated lipoprotein carriers, and each has its own cause, symptoms, incidence, clinical features, and response to diet and drug therapy.

Table 12–1 indicates the Frederickson classification of the five types of hyperlipidemias, their increased lipoprotein carrier fraction, appearance of plasma, values for plasma cholesterol and triglycerides, electrophoretic pattern, incidence, and clinical features.

Table 12–1 The Hyperlipidemias

Type	Increased Lipoprotein	Appearance of Plasma	Plasma Cholesterol	Lipids Triglycerides	Electrophoretic Pattern	Incidence and Clinical Features*
I	Chylomicrons	Thick layer of "cream" floating on clear plasma	Normal	Increased	Chylomicrons at origin	Rare May begin with abdominal pain
II a	LDL	Clear	Increased	Normal	Increased Beta lipoprotein	Common Tuberous xanthomata
b	LDL + VLDL	Slightly cloudy	Increased	Increased	Same + pre Beta lipoprotein	Thickened tendons Premature atherosclerosis
III	LDL + abnormal VLDL	Cloudy with layer of "cream"	Increased	Increased	Broad Beta lipoprotein	Uncertain Eruptive xanthomata Premature atherosclerosis Carbohydrate intolerance
IV	VLDL	Cloudy	Normal	Increased	Pre Beta lipoprotein	Common Obesity Carbohydrate intolerance Premature atherosclerosis
V	Chylomicrons + VLDL	Cloudy with layer of "cream"	Normal	Increased	Chylomicrons at origin + pre Beta lipoprotein	Rare Obesity Abdominal pain Eruptive xanthomata Carbohydrate intolerance

*Of the five major types of hyperlipidemia, only three are associated with an increased incidence of atherosclerotic disease. These are Types II (a and b), III, and IV.

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Drug Therapy for Hyperlipidemia

Typically, drug therapy in hyperlipoproteinemia has been used when diet is ineffective or its ultimate effect appears to have been reached.

In the treatment of patients with hyperlipidemia, diet and drug therapy are the two major methods employed. Many physicians prefer to begin treating their patients with a trial prudent diet (to be discussed later in this module) and then reevaluate after several months. If you attempt this dietary modification and it results in an inadequate response, you may further modify the diet, prescribe drug therapy, or do both. Table 12–2 lists the drugs of choice, their indications, dosage, drug interactions, and side effects in the treatment of hyperlipoproteinemia.

The Influence of Diet on Serum Lipid Levels

Dietary factors associated with serum lipid levels have been studied for many years and have produced conflicting results. Dietary modifications in the treatment of hyperlipidemic patients appear to be appropriate for a small percent of patients.

The association between dietary fat intake and coronary heart disease appears to be less strong than was once believed. Although several epidemiological studies have shown statistical differences between dietary fat intake and atherosclerosis when comparisons are made between groups of people living in different countries, the apparent cause-effect relationship of

these conclusions cannot be accepted. Usually there is a marked dissimilarity between many aspects of daily life other than diet. In both the Framingham[15] and Tecumseh[16] studies, no relationship was found between dietary practices and serum lipid levels. There was no decrease in mortality due to coronary heart disease between 1950 and 1960 when the admonition to decrease saturated fats and cholesterol and to increase polyunsaturated fats in the diet was popular. Since 1960, however, the decrease in coronary heart disease could be attributed to diet as well as to the increased ability to detect a heart attack before it occurs and to treat patients with coronary heart disease after an attack has occurred. Do not forget that the decrease in cigarette smoking because of lung cancer has undoubtedly reduced the incidence of sudden cardiac death. Between the years 1962 and 1973, also during the diet-heart era, there was no evidence that serum cholesterol levels decreased in people in the United States.

The results of clinical trials which examined the relationship between dietary intake and coronary heart disease have been conflicting. Many studies can be cited which show that when egg consumption is manipulated in both normal and hyperlipoproteinemic patients, there are no physiologically significant differences in serum cholesterol levels.[17-21] In these studies, various amounts of dietary cholesterol (from the small amount in one egg to the large amount of 1% of the diet) were added to diets of normocholesteremic and hypercholesteremic patients. Results indicate that serum cholesterol did not rise significantly above the initial physiological level. Of particular importance, blood cholesterol levels in normal men did not rise greater than 220 mg/dl. According to the National Pooling Project, serum cholesterol levels below the 240 to 250 mg/dl levels should be considered low risk for coronary heart disease.[22]

Hyperlipidemia in the United States population is not as rampant as one might be led to believe. According to the 1971-1974 Vital and Health Statistics of the National Health Survey, confirmed by the Lipid Research Center's Prevalence Study of the National Heart, Lung, and Blood Institute of NIH,[23] 4% of persons aged 18 to 24 years had serum cholesterol levels greater than 240 mg/dl while eating free choice diets. This percentage rose to 30% of those persons in the 45 to 55 age group.

It has been recommended that saturated fat be replaced with polyunsaturated fat at a ratio of polyunsaturated fatty acids to saturated fatty acids (P:S ratio) of two to one, assuming that polyunsaturated fatty acids will lower serum cho-

Table 12–2 Hypolipidemic Drugs

Drug	Indications	Dosage	Drug Interactions	Side Effect
Cholestyramine	Type II	12-32 gm/day	Decreases absorption of thyroid and digitalis	Nausea, constipation, increased gallstones
Clofibrate (Atromid-S)	Type III, IV, V	2 gm/day	Increases hypoprothrombinemia	Nausea, diarrhea
Nicotinic Acid	Type II, III, IV, V	1-6 gm/day	Exaggerates effect of ganglionic blocking agents	Flushing, nausea, diarrhea, hyperglycemia, fatty liver
Probucol (Lorelco)	Type II	500 mg twice/day	No effects on coumadin	Diarrhea, flatulence, nausea

Adapted from Halpern, S.L., *Quick Reference to Clinical Nutrition*. Philadelphia, J.B. Lippincott, 1979, pp 149-150

lesterol levels. When vegetable oils are substituted for animal fats, a lower serum cholesterol concentration may be due to differences in the dietary cholesterol content and subsequent absorption rather than to the P:S ratio. Ericson et al.[24] and Conner et al.[25] found no response of serum cholesterol to large changes in the P:S ratio in the diet. There are indications that high intakes of polyunsaturates are associated with malignant disease, yet research in this area is conflicting and incomplete.

Because the body produces fat endogenously when kilocalories consumed are greater than those expended, and because such endogenous fat is typically saturated animal fat, it does not stand to reason that exogenous dietary fat should be pathologic and endogenous saturated fat should be benign.

In summary, the imposition of dietary modifications on hyperlipidemic patients in the belief that dietary factors can cause or already have caused the patient's coronary heart disease appears to be appropriate for only a minor percentage of hyperlipidemic patients. The bulk of coronary heart disease subjects are victims of their genetic constitution and other risk factors, including embolism or thrombosis. In patients with coronary heart disease, the best dietary advice is to regulate kilocalorie intake so as to correct and/or prevent obesity and to use diet in controlling hypertension and diabetes mellitus if these conditions are present. Control of cigarette smoking should be enforced. Physical activity may be increased by instituting some form of regular exercise such as jogging, swimming, cycling, or tennis. It may also be desirable to help a patient combine a productive career with enjoyable recreation.

Dietary Management of the Patient with Hyperlipidemia

Almost everyone agrees that coronary heart disease is a multi-factored condition. There are different points of view on dietary intervention for normal persons, persons at high risk for coronary heart disease, and diagnosed coronary heart disease patients.

According to Hodges,[12] "Some authorities would argue that, until conclusive proof is available, there is little or no justification for attempting to modify the risk factors of individual patients or of population groups" (p. 108). Hodges calls these persons who seek a cause-effect relationship "academics." He terms the authorities on the other side "pragmatics," stating they "feel that epidemiologic studies, bolstered by (selected) metabolic studies in both experimental animals and man, are sufficient justification for a determined multifaceted approach to coronary heart disease and its prevention." (p. 108). This latter position is held by the American Heart Association (A.H.A.) (demonstrated in its "prudent diet") and by the Senate Select Committee on Nutrition which published the "Dietary Goals for the United States."

The American Heart Association's "prudent diet" for the general public is a well-balanced diet which recommends a reduction in the intake of animal fat, high cholesterol foods, and concentrated sugars. It also advocates substituting vegetable oils for animal fats. Similar recommendations have been published by the American Medical Association which states that they apply only to high risk patients, not to the public at large. Olson[26] believes that the Senate Select Committee's dietary goals including (1) reduction of dietary cholesterol to 300 mg daily, (2) reduction of total fat intake, and (3) increased consumption of polyunsaturated fatty acids are edging toward therapeutic diets for everyone during the life cycle; he states that they are not warranted for infants, children, adolescents, pregnant women, and the aged. Mann[27] cites the failure to elongate life by curtailing dietary cholesterol or by using drugs to be evidence against nationwide diet changes, but he does state that the most impressive array of epidemiologic evidence suggests that fit and active people are spared the complications of atherosclerosis. However, Blackburn[28] believes that an evolutionary change in the nation's dietary habits, cultural and personal eating patterns, exercise, and smoking habits will prevent atherosclerotic disease. Reiser[29] cites that 70% to 80% or more of people who maintain levels of serum cholesterol below 250 mg/dl while consuming the normal American diet of meats, eggs, and dairy products as evidence against changing the overall American diet. He further states that many proponents of

the A.H.A. position admit that only 20% to 30% of the population need this advice. A.H.A. claims that the other 70% to 80% will not be hurt by changing their ways. Reiser opposes this stance, stating that the prudent diet "unjustly seeks to deprive 70-80% of the population of desirable and protective foods. It makes balanced diets more difficult to achieve. To follow the advice could give many persons who require treatment other than diet a false sense of security" (p. 28).

Dietary Management of the Patient with Diagnosed Hyperlipoproteinemia

Dietary treatment for hyperlipoproteinemia involves achievement of ideal body weight and normal blood glucose levels, control of hypertension, and an attempt to lower blood cholesterol and triglyceride levels with dietary restriction of cholesterol, fat, and simple sugars.

When patients with elevated serum lipids are diagnosed as having hyperlipoproteinemia, Type I through Type V, diet has traditionally been the mainstay of therapy. Drugs are sometimes used in addition to diet for the purpose of lowering blood lipid levels. Whether or not diet is effective in promoting and sustaining lower blood lipid levels is questionable, yet some dietary aspects in the treatment of hyperlipoproteinemia are warranted — particularly achievement of ideal body weight and normal blood glucose levels.

Familial hypercholesterolemia (Type II) is the most common hyperlipidemia in children. Hypertriglyceridemia (Type IV) is the most frequently found hyperlipidemia in adolescents and adults. Both types are genetic, transmitted in an autosomal dominant manner.

Prior to the institution of any form of therapy, secondary causes of hyperlipoproteinemia should be diagnosed. Ruled out should be causes such as hypercholesterolemia due to hypothyroidism or diabetes mellitus, alcohol-induced hypertriglyceridemia, hepatic disease, renal disease, and drug-induced hyperlipidemia, especially from estrogen, oral contraceptives, steroids, and thiazides. When these secondary causes of hyperlipidemia are treated and controlled, the blood lipid pattern frequently returns to normal. A deficiency in the chylomicron glyceride hydrolyzing enzyme — lipoprotein lipase — in Type I hyperlipidemia results in a markedly delayed clearance of absorbed dietary fat from the blood stream; hyperchylomicronemia occurs. In Type IIa, familial hypercholesterolemia, serum cholesterol and low-density or beta-lipoprotein fractions are elevated. In Type IIb, an increase in serum cholesterol, triglycerides, low-density lipoproteins, and very low-density (pre-beta) lipoproteins occurs. Type III hyperlipoproteinemia is characterized by elevated cholesterol, triglycerides, and beta and pre-beta lipoproteins. Type IV is characterized by elevated serum triglyceride levels, normal or slightly elevated cholesterol, and an elevated, low-density lipoprotein fraction. Type V, a mixture of Types I and IV, is characterized by elevated chylomicrons, serum triglycerides, and very low-density lipoproteins. Low-density lipoprotein cholesterol may be normal or elevated.

When you choose to institute diet therapy in an attempt to lower blood lipid levels, Table 12–3 indicates the appropriate dietary modifications on which the patient and the family should be instructed.

If you wish to use booklets for instructing the patient and the family on a specific hyperlipoproteinemia (HLP) type diet, booklets are available for each type from the United States Department of Health and Human Services. Write to the United States Department of Health and Human Services, Public Health Services, National Institutes of Health, National Heart, Lung, and Blood Institute, Washington, DC, or to the Superintendent of Documents, Washington, DC and request the booklets entitled:

- "Diet 1: For Dietary Management of Hyperchylomicronemia";
- "Diet 2: For Dietary Management of Hypercholesterolemia";
- "Diet 3: For Dietary Management of Hypercholesterolemia with Endogenous Hyperglyceridemia";
- "Diet 4: For Dietary Management of Endogenous Hyperglyceridemia"; and
- "Diet 5: For Dietary Management of Mixed Hyperglyceridemia."

Table 12–3 Summary of Diets for Types I-V Hyperlipoproteinemia

	Type I	Type IIa
Diet Prescription	Low Fat 25–35 grams	Low cholesterol. Poly-unsaturated fat increased
Kilocalories	Not restricted	Not restricted
Protein	Total protein intake is not limited	Total protein intake is not limited
Fat	Restricted to 25 to 35 grams daily. Kind of fat not important	Saturated fat intake limited. Polyunsaturated fat intake increased
Cholesterol	Not restricted	As low as possible
Carbohydrate	Not limited	Not limited
Alcohol	Not recommended	May be used with discretion

Successful management of the high risk patient depends upon a close and enthusiastic working relationship between you and the patient. If a registered clinical dietitian is available, a referral for dietary counseling would be appropriate. Frequent return visits, teaching aids, and dietary counseling for the family are all beneficial. The dietary treatment must be individualized to fit the needs, likes, and dislikes of the patient. Since weight reduction is a prime objective regardless of its effect upon plasma lipid levels, its importance as a first step in management cannot be overemphasized (see Module 9 on obesity). A balanced caloric reduction diet plan will result in reduction of body fat and carbohydrate intake and will benefit patients who have a defect in both removal of and increased synthesis of triglycerides. Often hyperlipoproteinemic patients also have hypertension. (Module 11, on hypertension, will assist you in planning dietary modifications of sodium and potassium.)

Most diets restrict the intake of cholesterol to 300 mg daily when hypercholesterolemia is present. For hypertriglyceridemias that are carbohydrate-induced, the total carbohydrate is reduced, and simple sugars are eliminated insofar as possible.

Table 12-3 (continued)

Type IIb & Type III	Type IV	Type V
Low cholesterol Approximately: 20% kilocalories from Protein 40% kilocalories from Fat 40% kilocalories from Carbohydrate	Controlled carbohydrate to approximately 45% of kilocalories. Moderately restricted cholesterol	Restricted fat to 30% of kilocalories. Controlled carbohydrate to 50% of kilocalories. Moderately restricted cholesterol
Achieve and maintain "ideal" weight. Reduction diet if necessary	Achieve and maintain "ideal" weight. Reduction diet if necessary	Achieve and maintain "ideal" weight. Reduction diet if necessary
High protein	Not limited other than control of body weight	High protein
Controlled to 40% kilocalories	Not limited other than control of body weight	Restricted to 30% of kilocalories
Less than 300 milligrams	Moderately restricted to 300 to 500 milligrams	Moderately restricted to 300 to 500 milligrams
Controlled. Concentrated sweets are restricted	Controlled. Concentrated sweets are restricted	Controlled. Concentrated sweets are restricted
Limited to 2 servings daily	Limited to 2 servings daily	Not recommended

From *Dietary Management of Hyperlipoproteinemia A Handbook for Physicians and Dietitians* Department of Health, Education, and Welfare, No. (NIH) 75-110 Bethesda, MD, National Heart and Lung Institute, reprinted, 1974.

Foods Allowed on the Fat and Carbohydrate Modified Diet

A wide variety of foods can be used on a modified-fat diet to provide an acceptable, palatable diet by selecting appropriate foods from the basic food groups, using substitute products, and preparing foods from allowed ingredients. Limiting simple sugars has been suggested as appropriate therapy to decrease blood triglycerides.

Foods of plant origin such as fruits, vegetables, cereals, grains, legumes, and nuts do not contain cholesterol. Cholesterol is present in the fat and tissue of animal products only. Egg yolk, organ meats, and shrimp are high in cholesterol. Foods listed according to fatty acid composition are given in Table 12–4. Highly saturated fats are restricted on a modified fat diet.

Many foods which are available in supermarkets are good choices for use on hyperlipoproteinemic diets. Due to the continual addition and removal of processed foods in the marketplace, a listing of brand names soon becomes out of date.

Table 12–4 Foods Divided into Fatty Acid Composition Groups

More than 30% Saturated Fatty Acids	20% to 30% Saturated Fatty Acids	Less than 20% Saturated Fatty Acids
Butterfat	Poultry	Fish
Beef, lamb, pork, veal	Margarine*	Margarine*
Butter	Shortening	Oils, including peanut, corn, olive safflower, sesame
Margarine*	Cottonseed oil	
Shortening		Nuts
Coconut, palm oils		

The kind of fat and composition of fat in margarine vary considerably.

Egg substitutes, low-fat cheese, soybean vegetable protein, polyunsaturated margarines, low-fat frozen desserts, soybean non-dairy creamers, and poultry luncheon meats and wieners are current examples. Patients must learn to read and interpret labels. Advise them to purchase products labeled "low fat" and also to consume skimmed milk and products made with skimmed milk instead of whole milk. For those patients who also need to restrict dietary sodium, it is wise to advise them that highly processed and convenience foods are usually higher in sodium than less processed foods. Due to the sodium and fat contents of these foods, the patient on a diet for the control of hyperlipidemia will often need to prepare foods at home, using allowed ingredients. A number of helpful cookbooks with recipes for fat-controlled, low-cholesterol meals have been published. For a list of some of these books, consult Resources for the Patient at the end of this module.

For the hyperlipoproteinemic patient who should restrict carbohydrate intake in an attempt to lower blood triglycerides attached to very low-density lipoproteins, Table 12–5 lists those foods which contain complex and simple sugars. Limiting simple sugars and consuming complex carbohydrates has been suggested as appropriate therapy to decrease blood triglycerides.

As can be seen, carbohydrate in milk and fruit groups is considered simple (mono- and disaccharides of lactose, galactose, fructose, and sucrose), while carbohydrate in the bread group is considered complex (starch). Although milk, fruits, and vegetables contain simple sugars, they should not be eliminated completely from the diet. Moderate usage to supply optimal nutrition should include three servings of milk, two servings of fruit, and two servings of vegetables daily.

Because alcohol intake in many patients causes increased blood triglycerides and adds extra kilocalories but few other nutrients to the patient's diet, alcohol intake is limited to two servings daily for Type IIb, III, and IV patients. The kilocalorie value of one serving of alcohol should be substituted for one serving from the bread and cereal group in the following amounts:

- 1 ounce gin, rum, vodka, whiskey
- 2½ ounces dry table wine
- 1½ ounces dessert or sweet wine
- 5 ounces beer

Appendix A at the end of this module can be used as an office reference for instructing patients on a low-cholesterol, low-fat, low-carbohydrate diet. Appendix B includes a sample low-cholesterol, low-fat, low-simple sugar menu which supplies approximately 1,800 kilocalories. The menu could be made equivalent to 4 grams of sodium by using only ¼ teaspoon salt in cooking or at the table and no other salt during the day; all regular foods can be used and no special low-sodium foods must be purchased for a four-gram sodium diet. Foods such as salted crackers, salted pretzels, olives, canned bouillon, cured meats, and other foods especially high in sodium should be avoided or used sparingly.

Table 12-5 Food Classification by Carbohydrate Content

Complex	Complex and Simple	Simple
Breads and cereals	Cake	Beverages, carbonated
Crackers	Cookies	Candy
Flour	Vegetables	Fruit
Legumes		Ice Cream
Macaroni, spaghetti		Milk
Potatoes		Sugars
Rice		Syrups, molasses, honey

Summary

Cardiovascular diseases are related epidemiologically, pharmacologically, and therapeutically to nutrition. There is little hard evidence that lowering serum lipid levels by dietary manipulation or drug therapy protects against atherosclerosis or decreases morbidity and mortality from coronary heart disease. We believe that a sensible approach to the problem of coronary heart disease includes a broad program to minimize the major risk factors: hypercholesterolemia, hypertension, and cigarette smoking. To this end, we strongly encourage achievement of ideal body weight and normal blood glucose levels, and control of hypertension. Use of the hyperlipoproteinemic diets may be appropriate in diagnosed hyperlipidemic patients who are less than 40 years old, but use of routine low-cholesterol and low-fat diets for the general population appears to be without justification.

Test Your Knowledge

A white, 47-year-old man, married and the father of three children, comes to your office. He is 5 feet 8 inches in height, weighs 197 pounds, and he wishes to weigh 164 pounds. He works nights, twelve hours straight, three nights on and three nights off. He is moderately active in his work and swims regularly in the summer. On further questioning, you learn that he eats out often and that his dietary intake varies, depending on whether he is working or is at home. His weight has been constant for several years. You have requested and received the following laboratory test results:

Glucose tolerance test — normal
Blood pressure — 160/90
Triglycerides — 256 mg/dl
Cholesterol — 220 mg/dl
HDL — normal
LDL — normal
VLDL — excessive
Chylomicrons — normal

1. Which of the above findings concern you? (Answers are at the end of this module.)

The patient reports the following dietary intake to you:

When Working

Breakfast 9:20 p.m.

2 eggs and bacon
or
Pancakes and sausage
Coffee with 2 tsp sugar

20 to 30 cups of coffee with sugar during the night

When at Home

Breakfast 9:00 a.m.

Same as above

Lunch

Lunchmeat sandwich
Soup
Coffee with sugar

Lunch 4:30 a.m.

2 lunchmeat sandwiches
Cake, pie, or cookies
Coffee

Dinner 12:00 noon

Soup
2 grilled cheese sandwiches

Dinner 6:00 p.m.

Roast Beef — 8 ounces
Cooked vegetable
Mashed potatoes with gravy
2 to 6 slices bread with margarine
Canned fruit
Coke, 12 ounces
Coffee with sugar

Evening Snack

Pizza
Ice Cream

The patient uses salt at the table and margarine or bacon grease for seasoning foods at home.

2. What would you establish with the patient as important long-term nutritional objectives and short-term goals? List 3 each.

3. What diet order would be appropriate for this patient at this time?

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Resources for the Physician

Books

1. Thiele, V.F.: *Clinical Nutrition*. St. Louis, MO, C.V. Mosby, 63141, 1976. 225 pp. (softcover $6.95)
   Past and current diet therapy practices as well as useful basic data are included in this reference manual. Chapter 8 discusses cardiovascular disease.

Booklets

1. Brown, H.B.: *Current Focus on Fat in the Diet*. Chicago, IL, The American Dietetic Association, 430 North Michigan Ave., 60611, 1977. 31 pp. ($4.50)
   The purpose of this paper is to place the role of fat in perspective, to assess its effects in health and disease, according to present knowledge, and to discuss its contributions to a health-promoting food pattern.
2. Mikkola, M., Lees, R.S. and McCluskey, M.: *Low Cholesterol Calorie-Controlled Dietary Patterns*, rev. ed., Cambridge, MA, M.I.T. Arteriosclerosis Center, 40 Ames St., 02142. 16 pp. ($1.00)
   Guidelines are given for several caloric levels. Under various food groups, the caloric and cholesterol equivalents and the selection, preparation, and estimation of portions for different foods are discussed. A section on caloric content of alcoholic beverages as well as suggestions for dining out are given. Booklet is intended for professional use but can be used by individuals with advice of their physicians.
3. *Planning Fat-Controlled Meals for 1,200 and 1,800 Calories*. rev. ed., Dallas, TX, American Heart Association, 7320 Greenville Ave., 75231, 1966. 25 pp.
4. *Planning Fat-Controlled Meals for 2,000-2,600 Calories*. rev. ed., Dallas, TX, American Heart Association, 7320 Greenville Ave., 75231, 1967. 25 pp.
   Available to patients by a physician's prescription only. Available to physicians upon request. Booklet includes diet plans, menus, recipes, and shopping suggestions.

Resources for the Patient

Books

1. Eschleman, R. and Winston, M.: *The American Heart Association Cookbook*. New York, David McKay, 1973. 412 pp. (hardcover $9.95, softcover $6.95)
   Contains more than 400 tested recipes in which both fat and cholesterol are controlled. Tips on menus, shopping, and cooking are given. A chart of fatty acids and cholesterol in usual foods is included, as well as a comprehensive table of equivalents and a glossary.
2. Jones, J.: *Diet for a Happy Heart*. San Francisco, CA, 101 Productions, 834 Mission Street 94103, 1975. (hardcover $7.95, softcover $4.95)
   Contains 200 recipes for a low-cholesterol, low-saturated fat, sugar-free diet, encompassing dishes from all over the world. It lists the cholesterol and caloric count of each recipe.
3. Stead, E. and Warren, G.: *Low Fat Cookery*. New York, McGraw Hill, 1977. 407 pp. (softcover $4.95)
   Recommended "diet by the week" scheme which keeps average intake of total fat at either 25 or 50 grams per day. A tested way to cook for low-fat diets and still serve meals everyone will enjoy.

4. Zane, P.: *The Jack Sprat Cookbook*. New York, Harper & Row, 1973. 497 pp. ($12.95)
   Over 600 recipes using no foods exceptionally high in cholesterol or saturated fats which would appeal to a wide variety of tastes are offered. Fatty acid and cholesterol content of certain foods are given.

Booklets

1. Hursh, L.: *Coronary Heart Disease: Risk Factors and the Diet Debate*. Rosemont, IL, National Dairy Council, 60018, 16 pp. ($0.50)
   Reviews research identifying risk factors associated with increased likelihood of developing coronary heart disease. The current status of scientific knowledge about specific components of the diet is presented and discussed for the public.
2. Los Angeles District, California Dietetic Association: *A Guide to Hyperlipoproteinemia Diets for Patients*. Los Angeles, California Dietetic Association, 1609 Westwood Blvd., Suite 101, 90024. 33 pp. ($2.00)
   Offers information about the significance of blood lipid evaluation, definitions of dietary and medical terms, a presentation of the dietary plan, and recipes and tips for dining out. Gives brand names of products allowed and to be avoided.

Answers

1. You would be concerned with the following results:
   - Elevated triglycerides.
   - Elevated VLDL.
   - Elevated weight.
   - Hypertension.

2. The following long-term objectives would be appropriately established:
   - Reduce weight to 164 pounds.
   - Control hypertension.
   - Reduce serum triglycerides.
   - Consume a balanced diet.

   In order to achieve these long-term objectives, you will want to instruct the patient and his family to decrease the amount of kilocalories and simple sugars he consumes and decrease his salt intake. Specific short-term goals would be planned to meet these long-term objectives. The following short-term goals are appropriate:

   - Lose one pound per week on a weight reduction diet until goal of 164 pounds is reached.
   - Omit sugar from coffee and when working reduce number of cups of coffee; drink decaffeinated coffee or water.
   - Use skim milk, less margarine, and less bacon grease to decrease kilocalorie intake.
   - Use substitute seasonings for salt (see Module 11 on hypertension).
   - Walk or swim regularly.
   - Carry lunch to work.
   - Return in one month for follow-up visit.

3. A 1,550 kilocalorie, low-simple sugar, four-gram sodium diet would be appropriate for this patient. Table 12–6 is a meal pattern and sample menu which would be appropriate based upon this patient's ideal body weight (105 pounds for the first five feet in height, plus 6 pounds for each additional inch over five feet which equals 153 pounds) and multiplying this weight in pounds by 10 kilocalories per pound (10 kilocalories per pound is a rule of thumb appropriate for weight loss).

Table 12–6 Sample Meal Pattern and Menu

CALORIES 1560 CARBOHYDRATE 179 PROTEIN 76 FAT 60

DISTRIBUTION OF FOOD FOR THE DAY

9 or 9:30 BREAKFAST	NUMBER OF SERVINGS	SAMPLE MENU
FRUIT EXCHANGE LIST	1	1/2 cup unsweetened juice
BREAD EXCHANGE LIST	2	2 slices bread
MEAT EXCHANGE LIST	1	1 egg
FAT EXCHANGE LIST	2	2 teaspoons corn oil margarine
MILK EXCHANGE LIST	1	1 cup skim milk
		Coffee with artificial sweetener or black
Noon LUNCH		
MEAT EXCHANGE LIST	2	2 ounces lean meat, fish, poultry, low-fat cheese
BREAD EXCHANGE LIST	3	1 cup soup; 2 slices bread
VEG. EXCHANGE LIST		raw vegetable as desired
FRUIT EXCHANGE LIST	1	1 small fresh fruit
FAT EXCHANGE LIST	1	2 teaspoons mayonnaise
MILK EXCHANGE LIST	1	1 cup skim milk
4:30 or 6 DINNER		
MEAT EXCHANGE LIST	3	3 ounces lean meat, fish, poultry, low-fat cheese
BREAD EXCHANGE LIST	3	3 bread or 1 bread and 1 cup potatoes
VEG. EXCHANGE LIST		raw vegetables as desired
VEG. EXCHANGE LIST	1	1/2 cup cooked vegetables
FRUIT EXCHANGE LIST	1	1/2 cup unsweetened fruit
FAT EXCHANGE LIST	3	2 teaspoons corn oil margarine; 1 teaspoon salad dressing
MILK EXCHANGE LIST		

Appendix A

Table 12-7 Low-Cholesterol, Low-Saturated Fat, Low-Simple Sugar Diet

Foods	Foods Allowed	Foods Omitted
Beverages	Coffee (regular and decaffeinated), tea, unsweetened carbonated beverages, skim milk, products made with skim milk such as low-fat yogurt, cheeses, cottage cheese	Low-fat and whole milk, and products made with these milks, sweetened cocoa, sweetened drinks and fruitades. Imitation milk
Breads/Cereals	Any except those which should be omitted	Sugar-coated cereals, sweet rolls, other pastries
Desserts	Fruits, sugar-free gelatin desserts	All containing sugar, cream, whole and low-fat milk, eggs, butter, coconut, and pies, cakes, pastries, sherbet, ice cream, cookies
Eggs	Three eggs per week, prepared without fat	More than three eggs weekly including eggs used in cooking
Fats	Margarine made with vegetable oils (corn, safflower, soybean, cottonseed, olive, peanut, sesame) Salad dressings made with allowed oil. Nuts	Commercial mayonnaise, coconut oil, butter, lard, margarine made with hydrogenated shortening, bacon
Fruits	Three daily	Avocado
Soups and Sauce	Broth-based or those made with skim milk	All made with whole and low-fat milk or cream
Sweets	None	All candy, jelly, honey, molasses, marshmallows, syrups
Vegetables	Any, prepared without whole or low-fat milk or cream	None
Meat, fish, fowl, cheese	Lean beef, poultry without skin, fish, lean fresh pork, low-fat cheeses, dry curd (Farmer's) cottage cheese	Frankfurters, ham, luncheon meats, sugar cured meats, cheeses made with whole milk, liver, kidney, sweetbreads, and shrimp, lamb and beef should be limited to three servings per week.

Table 12–8 Sample Menu of a Low-Cholesterol, Low-Saturated Fat, Low-Simple Sugar Diet

Breakfast

1 citrus fruit or ½ cup citrus fruit juice
Cereal, cooked, unsweetened, 1 cup
Egg or egg substitute
Toast, 1 slice
Allowed margarine, 1 teaspoon
Milk, skim, 1 cup

Lunch

Soup, low-fat milk or broth-based, 1½ cups
Sandwich
  Bread, 2 slices
  Sliced chicken, baked, no skin, 2 ounces
  Tomato slice
  Lettuce leaf
  Mustard
Fresh fruit, 1 medium
Carrot slices, as desired
Milk, skim, 1 cup

Dinner

Lean beef or fish, broiled, 2 ounces
Potato, baked, 1 medium
Allowed margarine, 3 teaspoons
Roll, 1 medium
Tossed salad, any amount of greens
Vinegar and oil salad dressing, 2 tablespoons
Milk, skim, 1 cup
Fruit, fresh, 1 medium

Some Abbrevations Used in the Nutrition in Primary Care Series

ATP	adenosine triphosphate
c	cup
cc	cubic centimeter
CNS	central nervous system
FDA	Food and Drug Administration
gm	gram
IBW	ideal body weight
IU	International Units
kcal	kilocalorie
kg	kilogram
lb	pound
lg	large
MCV	mean corpuscular volume
MDR	minimum daily requirement
med	medium
mEq	milliequivalent
mg	milligram
MJ	megajoule
ml	milliliter
oz	ounce
RDA	Recommended Dietary Allowances
RE	retinol equivalents
sl	slice
sm	small
Tbsp	Tablespoon
TPN	total parenteral nutrition
tsp	teaspoon
USDA	United States Department of Agriculture