In this pharmaceutically driven world, many clinicians have forgotten that dietary therapy can significantly improve dyslipidemia. Even in patients taking lipid-modifying drugs, dietary therapy achieves additional lipid-lowering that augments the therapeutic effects of drugs.1

Five Dietary Recommendations for High LDL Levels

Case No. 1
A 5-ft-8-in tall, 172-lb, 65-year-old woman has a total cholesterol level of 289 mg/dL; triglycerides, 108 mg/dL; LDL, 205 mg/dL; and HDL, 62 mg/dL. She does not smoke and has blood pressure of 122/70. There is no family history of premature coronary artery disease, but both her parents died in their 80s from massive strokes. Her older brother also had a stroke at age 60. She has tried 4 different statin drugs in the past 2 years and states that with each drug, she develops the insidious onset of lethargy, fatigue, and achiness, which resolve within 1 week of stopping the drug. She is highly motivated and is requesting dietary recommendations to reduce her LDL cholesterol.

(1) Reduce Saturated Fat Intake to <7% of Calories
The most powerful factor in raising LDL cholesterol levels is saturated fatty acids. Hepatic LDL receptor activity is modified by the saturated fat content of the diet: More saturated fat equals lower receptor activity and hence higher plasma LDL levels. Substituting monounsaturated fat, polyunsaturated fat, or carbohydrates for saturated fat in the diet can result in nearly 80% lowering of LDL. Two different dietary approaches can be used to reduce saturated intake:

(a) Substitute low-saturated-fat foods (low-fat dairy products, lean meats) for high-saturated-fat foods (full-fat dairy products, butter, cheese, ice cream, bacon, sausage, ribs, fatty meats, donuts).
(b) Reduce total fat in the diet.

The latter has been a popular strategy on the basis of the rationale that all fats contain some saturated fat, and reduction in total fat therefore will achieve a reduction in saturated fat. This strategy, however, is nearly ineffective for patients consuming primarily low-saturated-fat vegetable oils such as canola oil. The total-fat strategy also may have backfired when such patients did not achieve an LDL reduction despite some sacrifice in dietary choices. For these patients, consultation with a registered dietitian (RD) can be invaluable for identifying sources of saturated fat in the patient’s diet. The RD can make suggestions with regard to alternative selections that will reduce saturated fat intake. According to the magnitude of changes in saturated fat intake, a 5% to 10% reduction in LDL can be achieved.

(2) Reduce Dietary Cholesterol Intake to <200 mg/d
Reducing dietary cholesterol intake improves LDL cholesterol levels by increasing LDL receptor activity. Although most patients avoid cholesterol-rich foods such as organ meats and egg yolk, few recognize the contribution of animal products to the cholesterol content of the diet. For example, every ounce of beef, lamb, pork, poultry, and fish contains approximately 25 mg of dietary cholesterol, and 1 cup of milk contains 4 to 33 mg of dietary cholesterol (higher-fat dairy products contain higher amounts).

Many patients consume >200 mg of dietary cholesterol as the result of excessive meat and dairy intake. For those patients consuming >6 to 7 oz of meat a day, restricting meat portion sizes is a key way to achieve dietary cholesterol goals. A piece of meat the size of a deck of cards is 3 oz, and only 2 such portions are recommended each day. Restricting animal meat intake has the added benefit of reducing saturated fat intake. Switching from whole milk (33 mg cholesterol/8 oz) to 1% milk (10 mg cholesterol/8 oz) also achieves a significant reduction. Restricting dietary cholesterol can achieve a 1% to 3% reduction in LDL.
(3) Trim Excess Calories

Obesity leads to an increased production of very low-density lipoproteins (VLDL) by the liver. Reduction of body weight reduces the production rate of these LDL precursors and hence reduces LDL. Because most patients find it difficult to lose weight, and because it is only the rare person who can increase physical activity sufficiently to lose weight, a consistent dietary plan that reduces caloric intake is required. The healthcare professional can help guide caloric restriction by estimating caloric needs for weight management (Table 1) and providing a daily caloric ceiling. Subtracting 500 calories from the number of calories needed to maintain weight gives a good formula that can produce a 1- to 2-lb/wk weight loss. For patients who don’t want to count calories, practical solutions, such as consuming only half of the restaurant portion served; eliminating bread, chips, and extras that come with a meal; eating only one cookie instead of 3; choosing calorie-free beverages instead of juices or soda; cutting out snacks; and whenever possible, self-preparing meals, can help compliance. As little as a 5-lb weight loss can double the LDL-lowering achieved by changes in diet composition alone. Trimming excess calories can reduce LDL cholesterol levels by 5% to 20%.

(4) Add Water-Soluble Fiber

Water-soluble fiber such as oat bran, grapefruit pectin, and psyllium also reduces LDL cholesterol levels. Approximately two thirds of dietary fiber is water insoluble (eg, wheat fiber), so patients can choose either a high-fiber diet or a diet in which oat fiber and fresh fruits are prevalent. The mechanism of action is unknown, but a 3% reduction in LDL can be achieved when 3 g/d is added to the diet.

(5) Add Stanol or Sterol Ester Margarines

Phytonutrients are the plant equivalent of cholesterol; both function as cell membrane steroids. Less than 5% of dietary plant sterols are absorbed. During their intestinal transit, plant sterols impede cholesterol absorption in the small intestine. Besides impeding dietary cholesterol absorption, sterol and stanol esters impede biliary cholesterol reabsorption. A 10% reduction in LDL levels is achieved with a dose of 2 g/d of phytonutrients.

Case No. 1: Clinical Results

This patient reviewed her diet with an RD. Saturated fat content was already <7% of her calories, but her almost-daily office luncheons contained large meat portions that exceeded her dietary cholesterol allotment. The patient reported a 10-lb weight gain over the previous 5 years.

She was instructed to reduce caloric intake and was successful at losing 5 lb. She began taking psyllium 3 times a day before meals, as well as one pat of a stanol ester margarine at breakfast and dinner. Repeat lipid levels on this regimen show a total cholesterol of 220; triglycerides, 117; LDL, 136; and HDL, 60 mg/dL. The patient has successfully followed this regimen for the past 2 years and her LDL cholesterol values remain in the low 130s.

Four Dietary Recommendations for Patients With Low HDL in the Setting of Triglycerides >150

Case No. 2

A 56-year-old male construction worker, 5 ft 11 in tall and 210 lb, is sent for evaluation of low HDL. The patient has a coronary heart disease (CHD) risk equivalent based on the National Cholesterol Education Program (NCEP) Adult Treatment Panel (ATP) III global risk scoring. He smokes 2 packs of cigarettes per day, is treated for hypertension, and has a baseline HDL of 32. He has a positive family history of premature CHD; his father died at age 50 of a myocardial infarction. Statin therapy was started on the basis of an initial lipid profile of total cholesterol, 256; triglycerides, 380; LDL, 156; HDL, 32; and non-HDL, 224 mg/dL. On maximum-dose statin therapy, lipid values improved to a total cholesterol level of 161; triglycerides, 290; LDL, 68; HDL, 35; and non-HDL, 126 mg/dL. He is not motivated to quit smoking but is curious why his HDL is so low despite his self-reported excellent physical fitness and beer intake. You focus on recommendations to raise HDL.

(1) Trim Excess Alcohol Intake to <3% of Calories

Alcohol is the macronutrient with the strongest linear association to serum triglycerides. In patients with elevated serum triglycerides, excess alcohol can further exacerbate the dyslipidemia. Although most patients with excess alcohol intake have a high HDL, patients with an underlying dyslipidemia can have low HDL despite high alcohol intake. Patients who make their own drinks need to use a jigger to measure alcohol and a measuring cup to measure wine intake. Limit hard liquor intake to no more than 1.5 oz/d, beer intake to one 12-oz beer, and wine intake to 5 oz (2/3 cup). As much as a 50% reduction in triglycerides can be achieved.

(2) Stop Smoking

Smoking is associated independently with low HDL cholesterol levels. Smoking cessation increases HDL cholesterol levels 5% to 10%.

(3) Evaluate for Metabolic Syndrome

NCEP ATP III has defined the presence of the metabolic syndrome with 3 or more of the 5 factors in Table 2. For each criterion, specific dietary advice can be offered, but weight loss is a universal recommendation. Patients with the meta-

**TABLE 1.** Trimming Excess Calories: Defining Caloric Intake Requirements to Maintain Weight

| (A) Resting metabolic rate can be estimated by the Harris Benedict Equation
| Men = 66.5 + (13.7 × W) + (5 × H) − (6.8 × A)
| Women = 656 + (9.6 × W) + (1.8 × H) − (4.7 × A)
| (B) A simplified version incorporating sex differences has been calculated by Owen
| Men = [900 + 4.5 × (wt in lb)] × activity factor
| Women = [800 + 3.2 × (wt in lb)] × activity factor

*W indicates weight in kg; H, height in cm; and A, age in years. Note that younger persons need more calories than older persons, obese persons need more calories than lean persons, and men need more calories than women.

†Where low activity factor = 1.2 (eg, sedentary job); moderate = 1.4; high = 1.6 (eg, manual labor; daily exercise program).
The metabolic syndrome are exquisitely responsive to small changes in weight, and weight loss achieves significant reductions in the defining factors of the syndrome. Although the exact mechanism mediating these improvements is unknown, weight loss improves insulin therapy.

(a) Trim excess calories. Evaluate body weight with body mass index and waist circumference. Hypocaloric diets, even without significant weight loss (eg, restricting caloric intake by only 200 calories per day), will reduce fasting triglyceride levels 5% to 20% by reducing post-prandial contributions.

(b) Evaluate fasting blood sugar. Glucose intolerance, defined as fasting glucose $<110$ mg/dL, is associated with higher triglyceride levels. Dietary therapy aimed at improving glucose intolerance (ie, weight reduction; avoiding large meals in favor of smaller meals and snacks) can improve lipid levels by both reducing hepatic production of triglycerides and reducing post prandial dietary tri-glycerides. A 10% to 20% reduction in triglycerides can be achieved easily.

(c) Increase physical activity. A regular exercise program can reduce triglycerides by stimulating triglyceride uptake by metabolically active muscle. The benefits of physical activity can be enhanced if weight loss is concurrently achieved. A 10% to 40% reduction in triglycerides can be achieved.

(d) Evaluate the percent calories from fat versus carbohydrate. Individuals with stringent diet programs very low in fat (eg, Pritikin, Ornish) may have a carbohydrate-induced hypertriglyceridemia. Adding back fats that are low in saturated and transfatty acids (eg, vegetable oils, nuts, avocados) can reduce triglycerides 10% to 30% and raise HDL cholesterol levels 5% to 15%.

(4) Consider the Use of Omega 3 Fatty Acids
High-dose omega 3 fatty acids (6 to 12 g/d) provide therapeutic reductions in serum triglycerides levels (40% to 80%). The mechanism is unknown. Although dietary intake of 9 to 12 oz salmon per day can provide this benefit, it is more easily achieved by concentrated fish oil supplements. Fish oil supplementation can worsen glucose intolerance and can have anticoagulant effects; its use should therefore be monitored in patients with glucose intolerance or diabetes.

Case No. 2: Clinical Results
This patient drank heavily Friday and Saturday night (>12 beers per evening) but did not drink during the week. His appointments usually were Monday morning, and a trial of a no-alcohol weekend produced fasting serum triglycerides of 160. He refused to quit smoking. Evaluation for the metabolic syndrome (waist circumference of 44 in, fasting glucose of 115 mg/dL, and blood pressure of 139/88) confirmed that this patient had all of the defining characteristics of the metabolic syndrome. The patient believed he could trim off snack calories on his drive home and agreed to park his car further from the job site. He reluctantly agreed to limit beers to no more than 2 per day on weekends. His diet was already high in fat. Repeat lipid measurements 3 and 6 months after a 3-lb weight loss, physical activity change, and reduction in alcohol showed a total cholesterol level of 150; triglycerides, 140; LDL, 84; and HDL, 38 mg/dL.
Three Dietary Recommendations to Raise HDL

Case No. 3
A 64-year-old, high-profile businessman who sustained a myocardial infarction 5 years ago is self-referred for low HDL. He is physically active and jogs 3 miles per day. He is meticulous about his diet. He is 6 ft tall and weighs 135 lb. He does not take lipid-lowering drugs and is proud of his total cholesterol level of 149; triglyceride level, 120; LDL, 99; and HDL, 33 mg/dL, but he doesn’t like the low HDL. Recommendations for this patient are as follows.

(1) Trim Excess Calories
A linear inverse relationship exists between body mass index and HDL cholesterol levels. Weight reduction, similar to disorders of simple hypertriglyceridemia, can be effective in raising HDL cholesterol levels by 5% to 30%.

(2) Increase Physical Activity
Small, incremental increases in HDL cholesterol levels (1 to 2 mg/dL) are seen with increased physical activity. Larger increases are seen with greater increases in activity.

(3) Increase Dietary Fat
HDL cholesterol levels are inversely related to total fat intake. In patients who consume <25% of calories from total fat, an increase in dietary fat intake may increase HDL cholesterol levels measurably. Because increases in saturated fat intake will also raise LDL cholesterol levels, the extra dietary fat should be low in saturated fat. An easy way to add fat back to a diet that is otherwise healthy is to add oil as salad dressing or to add a quarter of a cup of nuts to the diet. Any type of nuts will do; all are low in saturated fatty acids. Raw or roasted nuts can be used; even if nuts are roasted in coconut oil, little of the roasting fat ends up on the roasted nut. The patient must be counseled to reduce calories from other sources concurrently to prevent weight gain that could obliterate the benefits.

Case No. 3: Clinical Results
This patient already is lean and physically active. His diet, however, is nearly devoid of fat because he has a long-standing belief that dietary fat would end up in his arteries. He was willing, however, to eat nuts. Adding nuts to his diet provided a remarkable improvement in lipids: total cholesterol, 162; triglycerides, 110; LDL, 98; and HDL, 42 mg/dL.3

References

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