WHAT IS THE DASH DIET?

DASH stands for Dietary Approaches to Stop Hypertension. This eating plan was initially developed to lower blood pressure, but it has since been found to modify several disease risk factors and outcomes, including improvements in cholesterol levels and insulin sensitivity. This diet favors meals that are low in animal and dairy fat and rich in fruits, vegetables, and whole grains. It is a well-balanced diet that can be followed by everyone, including those in low socioeconomic strata, to help lead a healthy lifestyle (Table 89.1). It is similar to the antiinflammatory diet discussed in Chapter 88.

HOW MUCH CAN I EXPECT MY BLOOD PRESSURE TO COME DOWN?

Two sentinel studies have investigated how adherence to the DASH diet can reduce blood pressure. The original study, which took place among four academic health care centers, divided subjects into three groups: one ate a normal American diet, one ate an American diet but with more fruits and vegetables, and one ate the DASH diet. In those eating the DASH diet and with no high blood pressure, the average systolic value dropped by 5.5 mm Hg and the diastolic value by 3 mm Hg. For those who already had high blood pressure, the systolic value dropped by 11.6 mm Hg and the diastolic value by 5.3. Blood pressure also dropped in the group eating more fruits and vegetables, but not as much. Furthermore, these changes occurred after just 2 weeks on the diet.

The second DASH trial examined the effect of a reduced dietary sodium intake (at three separate levels: 3300, 2300, or 1500 mg daily) as participants consumed a normal American diet or followed the DASH eating plan. Results showed that reducing dietary sodium lowered blood pressure for both eating plans, but at each level, blood pressure was lower for those on the DASH eating plan. These studies emphasize and highlight that specific amounts of potassium, magnesium, and fiber match the diet. In those with high blood pressure, the DASH diet on an average lowered systolic blood pressure by 11.6 mm Hg and diastolic blood pressure by 5.3 mm Hg.

BESIDES LOWERING SODIUM, BY WHAT OTHER MEANS MIGHT THE DASH DIET BENEFIT HEALTH?

Oxidative stress refers to one’s ability to detoxify the products of cellular damage. Much of this damage is caused by inflammation, which plays a foundational role in many chronic diseases, including obesity. In a small study, investigators found that the DASH diet decreased blood pressure and enhanced antioxidant capacity, especially in obese individuals. In another study, researchers found lower levels of proinflammatory markers, including C-reactive protein and interleukin-6, among those consuming this diet.

Researchers have postulated the importance of potassium, magnesium, and fiber in the DASH diet’s role in lowering blood pressure. One crossover study, for example, had obese and lean individuals consume a usual diet, the DASH diet, and a usual diet supplemented with specific amounts of potassium, magnesium, and fiber matching those of the DASH diet. Each eating plan was also matched for calcium and sodium. After 3 weeks, only obese individuals adhering to the DASH diet showed an improvement in blood pressure and endothelial function. The study’s investigators concluded that nutritional factors other than these five must be contributing to the observed health benefits, and these remain a topic of further investigation.

The DASH diet also contains nitrate-rich root vegetable like beets, carrots, and turnips. Consuming nitrates (NO\textsubscript{3}⁻) from such sources may increase the body’s available nitric oxide (NO), which may lead to vasodilation and decreased blood pressure. Ingested nitrates (NO\textsubscript{3}⁻) are reduced to nitrates (NO\textsubscript{2}⁻) by enteral bacteria and then are reabsorbed by the intestines and excreted in the stool (the reason manure is such a good fertilizer, which is rich in nitrates). Nitrites are further reduced in the endothelium to NO (Fig. 89.1).

In a study of 72 hypertensive patients, 36 were given 250 mL of beetroot juice once daily (6.4 mmol nitrate) and 36 were given a nitrate-free beetroot juice placebo. The 24-hour blood pressure monitoring showed sustained reductions of 7.7 mm Hg in systolic pressure and 5.2 mm Hg in diastolic pressure in the treatment group. This is just slightly less than the average blood pressure drop with single antihypertensive drug therapy (9.1 mm Hg/5.5 mm Hg). The nitrate-rich beetroot juice also improved endothelial function by ∼20%. 7
The DASH Diet

<table>
<thead>
<tr>
<th>Food Group</th>
<th>Daily Servings</th>
<th>Serving Sizes</th>
<th>Examples and Notes</th>
<th>Significance of Each Food Group in the Dash Eating Plan</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grains and grain products</td>
<td>7–8</td>
<td>1 slice bread</td>
<td>Whole wheat bread, English muffin, pita bread, bagel, cereals, grits, oatmeal, crackers, unsalted pretzels, and popcorn</td>
<td>Major sources of energy and fiber</td>
</tr>
<tr>
<td>Vegetables</td>
<td>4–5</td>
<td>1 cup raw leafy vegetables</td>
<td>Tomatoes, potatoes, carrots, green peas, squash, broccoli, turnip greens, collards, kale, spinach, artichokes, green beans, lima beans, sweet potatoes</td>
<td>Rich sources of potassium, magnesium, and fiber</td>
</tr>
<tr>
<td>Fruits</td>
<td>4–5</td>
<td>6 oz fruit juice</td>
<td>Apricots, bananas, dates, grapes, oranges, orange juice, grapefruit, grapefruit juice, mangoes, melons, peaches, pineapples, prunes, raisins, strawberries, tangerines</td>
<td>Important sources of potassium, magnesium, and fiber</td>
</tr>
<tr>
<td>Low-fat or fat-free dairy foods</td>
<td>2–3</td>
<td>8 oz milk</td>
<td>Fat-free (skim) or low-fat (1%) milk, fat-free or low-fat regular or frozen yogurt, low-fat and fat-free cheese</td>
<td>Major sources of calcium and protein</td>
</tr>
<tr>
<td>Meats, poultry, and fish</td>
<td>2 or less</td>
<td>3 oz cooked meats, poultry, or fish</td>
<td>Select only lean; trim away visible fat; broil, roast, or boil instead of frying; remove skin from poultry</td>
<td>Rich sources of protein and magnesium</td>
</tr>
<tr>
<td>Nuts, seeds, and dry beans</td>
<td>4–5 per week</td>
<td>1.5 oz or 1/2 cup nuts</td>
<td>Almonds, filberts, mixed nuts, peanuts, walnuts, sunflower seeds, kidney beans, lentils</td>
<td>Rich sources of energy, magnesium, potassium, protein, and fiber</td>
</tr>
<tr>
<td>Fats and oils†</td>
<td>2–3</td>
<td>1 tsp soft margarine</td>
<td>Soft margarine, low-fat mayonnaise, light salad dressing, vegetable oil (such as olive, corn, canola, or safflower)</td>
<td>DASH has 27% of its calories from fat, including that in or added to foods</td>
</tr>
<tr>
<td>Sweets</td>
<td>5 per week</td>
<td>1 tsp sugar</td>
<td>Maple syrup, sugar, jelly, jam, fruit-flavored gelatin, jelly beans, hard candy, fruit punch, sorbet, ices</td>
<td>Sweets should be low in fat</td>
</tr>
</tbody>
</table>

*Equals 1/2–1 1/4 cup, depending on cereal type. Check the product’s nutrition label.†Fat content changes serving counts for fats and oils. For example, 1 tbsp of regular salad dressing equals one serving; 1 tbsp of a low-fat dressing equals 1/2 serving; 1 tbsp of a fat-free dressing equals zero servings.

From the Dietary Approaches to Stop Hypertension study, as published by the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure and the National High Blood Pressure Education Program Coordination Committee. The sixth report of the Joint National Committee on prevention, detection, evaluation and treatment of high blood pressure. Arch Intern Med. 1997;157:2413–2446.

Proton pump inhibitors reduce enzymes (DDAH, ADMA) that are needed to make nitric oxide. Taking this class of medicines may negate the beneficial influence vegetables have on blood pressure and may help explain the increased risk for myocardial infarction seen with long-term use of this class of medicine. H2 blockers do not inhibit these enzymes.

**BESIDES LOWERING BLOOD PRESSURE, HOW ELSE DOES THIS DIET AFFECT CARDIOVASCULAR HEALTH?**

A study of 116 men and women with metabolic syndrome showed that consuming a DASH diet versus a control diet can reduce most of the metabolic risks, including total cholesterol, low-density lipoprotein, weight, triglycerides, and fasting blood glucose concentration, while raising high-density lipoprotein. Although the magnitude of the effects varied by sex, they were positive in both groups. An investigation of 31 type 2 diabetic individuals also found favorable changes in these parameters, including hemoglobin A1c (decrease of 1.7), and adherence to this diet may actually have the potential to prevent type 2 diabetes. Interestingly, the lipid- and glucose-lowering effects of the DASH diet seem to be independent of sodium intake, which again supports the notion that this eating plan works through several nutritional mechanisms.
kidney stones, even in participants with lower calcium intake.\(^{11}\)

Regarding cardiovascular disease–oriented outcomes, the DASH eating plan has been shown to lower the rates of stroke,\(^{12}\) heart failure events (including mortality),\(^{13}\) and coronary artery disease.\(^{14}\)

**DOES THIS DIET REDUCE THE RISK FOR CANCER?**

A prospective study assigning a DASH score to more than 100,000 participants showed an 80% reduction in colorectal cancer between the top and bottom 20% of scores during a 26-year period. Those following a Mediterranean diet had no such decrease in their risk.\(^{15}\) This study was supported by a Canadian study also showing a reduction in colorectal cancer.\(^{16}\) A review of the available research suggests an overall reduction in the incidence of cancer among those who eat a DASH diet.\(^{17}\)

**CAN THE DASH DIET SLOW COGNITIVE DECLINE?**

In a sample of 826 older adults with an average age of 81 years, participants filled out a food frequency questionnaire related to both the DASH diet and the Mediterranean diet. Those who ate the most foods in both these dietary plans had the slowest rate of cognitive decline. The DASH diet was rated on a scale of 1–10. For a one-unit higher DASH score, rates of cognitive decline were 0.007 standard units slower, which was equivalent to adults aged at least 4.4 years younger.\(^{19}\)

**WHAT FOODS ARE EMPHASIZED IN THIS DIET, AND HOW DO THEY INFLUENCE ONE’S HEALTH?**

To summarize, the diet is:

- **High** in fruits and vegetables. These are rich in antioxidants (especially those with vibrant colors), are relatively low in calories, and contain significant fiber.
- **Low** in dairy, animal meat, and saturated fat. These fats increase the risk for atherosclerosis.
- **High** in nuts, seeds, and beans. These are high in protein and in monounsaturated and polyunsaturated fats, which can decrease inflammation and cardiovascular disease.
- **Low** in snacks and sweets. Many of these foods contain partially hydrogenated fats that act to preserve shelf life. These types of fats are sources of trans–fatty acids that play a significant role in increasing the risk for heart disease. Many common snacks are also composed of simple carbohydrates, which cause a rapid rise in insulin after they are consumed. Over time, elevations in insulin result in the body becoming less responsive to its effect. In turn, the body will start to produce excessive amounts of insulin, resulting in more inflammation and elevated risk for cardiovascular disease.
- The diet is based on 2000 calories a day. Large portion sizes are a major contributor to rising obesity rates worldwide. Combining this diet with a regular exercise routine can lead to even more dramatic decreases in blood pressure and other chronic diseases.
Key Web Resources

The National Heart, Lung, and Blood Institute (NHLBI). A summary of the DASH diet and its benefits
http://www.nhlbi.nih.gov/health/health-topics/topics/dash

The National Heart, Lung, and Blood Institute (NHLBI). A PDF patient handout explaining the how to use the DASH diet to lower blood pressure

REFERENCES

References are available online at ExpertConsult.com.
REFERENCES