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THERAPEUTICS INITIATIVE Evidence Based Drug Therapy

therapeutics letter
Oct/Nov/Dec 2003

Can blood pressure be lowered by a change in diet?

Evidence from the DASH trials

Case

You have been following a 52-year-old Caucasian nurse with menopausal symptoms for the last 2 years. You have not prescribed anything and her symptoms are dissipating. You have recorded 6 sets of blood pressure (BP) measurements over this period of time and the average of these measurements is 146/93 mmHg. She is healthy, exercises regularly, is a non-smoker and does not drink alcohol. Her mother is 82 years old and is currently being treated for high BP. Physical examination and laboratory tests are normal. Fortunately, you have recently read the Cochrane systematic review "Pharmacotherapy for hypertension in women of different races" and are aware that the best available evidence is that drug "treatment of hypertension in white women aged 30 to 54 years old did not show statistically significant benefit or harm".[1] She asks whether there is anything other than drugs that would lower her BP. You remember hearing about the DASH trial but don't remember any details. You tell her that you will look into it and advise her at her next visit.

What makes the DASH trials different from other nutritional trials?

Most nutritional trials measured the effect of a diet plus the degree to which the subjects are able to comply with the diet. In contrast participants in the DASH trials were provided with all of their food, including snacks and cooked meals. **The DASH trials are thus "feeding trials" that precisely controlled the food composition and intake.**

DASH trial [2, 3, 4]

The DASH trial enrolled 459 subjects (49% female, 60% black) with systolic BP < 160 mmHg and diastolic BP between 80 and 95 mmHg. For 3 weeks they were fed a diet that was low in fruits, vegetables, and dairy products, with a fat content typical of the average diet in the United States (control diet). They were then randomly assigned to receive one of 3 diets for 8 weeks: control diet, diet rich in fruits and vegetables (fruit and veggie), or diet with reduced saturated and total fat, which was rich in fruits, vegetables and low-fat dairy products (combination). Sodium and caloric intake were the same for each of the 3 diets. Both experimental diets lowered BP compared with the control diet, but the effect was greatest in patients with high BP who ate the combination diet (see Table 1). **This combination diet is now commonly referred to as the DASH diet.**

DASH-Sodium trial [5, 6, 7]

This trial examined the effects of different intakes of dietary sodium with or without the DASH (combination) diet in individuals with BP between 120/80 and 159/95 mmHg. A total of 412 subjects (57% female, 57% black) were randomly assigned to the control diet or the DASH diet. Within the assigned diet, the intake of sodium was changed every 30 days (high, intermediate, or low) in random order. The average sodium excretion in mmol/day was 143, 107, and 66 in subjects eating the high, intermediate and low sodium diets, respectively.

Table 1. Effect of two diets on BP as compared to control diet

Baseline Blood Pressure		Fruit and Veggie		Combination	
Systolic (mmHg)	Diastolic (mmHg)	Change in BP (mmHg) Systolic	Diastolic	Change in BP (mmHg) Systolic	Diastolic
140-159	90-95	- 7.2*	- 2.8*	- 11.4*	- 5.5*
< 140	80-89	- 0.8	- 0.3	- 3.5*	- 2.1*

* $p < 0.01$.

Mailing Address: Therapeutics Initiative
The University of British Columbia
Department of Pharmacology & Therapeutics
2176 Health Sciences Mall
Vancouver, BC Canada V6T 1Z3

Tel.: (604) 822•0700
Fax: (604) 822•0701
E-mail: info@ti.ubc.ca
Web: www.ti.ubc.ca
(all Therapeutics Letters, Course Information)

Reducing sodium in the diet reduced systolic and diastolic BP in a dose related fashion (not shown). **The drop in BP was greatest in the subjects with high BP who ate the low sodium DASH diet (Table 2).** Further analysis of the DASH-sodium trial demonstrated that BP decreased gradually and was still decreasing at 4 weeks, the last measurement. Individual patient analysis also failed to support the common belief that the reduction in blood pressure is limited to salt sensitive subjects.[8] **An additional benefit of the low sodium diet was that fewer patients reported headaches, 39% low-sodium control and 36% low-sodium DASH versus 47% high-sodium control.**

What does this mean for this patient?

Two interventions could be offered to this patient. If she is presently eating an average North American diet and adopts either the DASH diet or the low sodium diet she could expect to achieve a BP < 140/90 mmHg. If she adopts both interventions she could expect a greater BP reduction (12/6 mmHg, see Table 2). **This reduction in BP is of a larger magnitude than can be achieved with single drug therapy.** [9,10]

What are the limitations of the DASH diets?

Long-term morbidity and mortality outcomes for a low sodium diet or the DASH diet are unknown.[11]

In addition, patients find it difficult to make lifestyle changes and maintain them. Up to 75% of sodium ingested by the average person comes from processed foods, making the task of sodium reduction additionally difficult. This approach is therefore only practical for motivated patients.

How can you assist a motivated patient?

Patients can obtain information about the DASH diets at this website: www.nhlbi.nih.gov/health/public/heart/hbp/dash

Collecting 24-hour urine for potassium and sodium establishes where the patient is at baseline; subjects eating an average North American diet excrete approximately 40 mmol of potassium per day and 150 mmol of sodium per day. The potassium target for the DASH diet is a 24-hour urinary potassium of 80 mmol. The sodium target for a low-sodium diet is a 24-hour urinary sodium of 50-100 mmol. These tests cost $1.49 each in BC.

Conclusions

Substantial BP lowering can be achieved by a reduced dietary sodium intake, the DASH diet, or a combination of the two. This approach is applicable to those patients consuming an average North American diet who are motivated to make a change.

Table 2. Effect of low-Na diets on BP as compared to diets with higher Na intake

Baseline Blood Pressure		Low-Na Control diet		Low-Na DASH diet	
Systolic (mmHg)	Diastolic (mmHg)	Change in BP (mmHg) Systolic	Diastolic	Change in BP (mmHg) Systolic	Diastolic
140-159	90-95	- 8.3*	- 4.4*	- 11.5*	- 5.7*
120-139	80-89	- 5.6*	- 2.8*	- 7.1*	- 3.7*

*p < 0.01 as compared to higher Na control diet.

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This Letter contains an assessment and synthesis of publications up to December 1, 2003. We attempt to maintain the accuracy of the information in the Therapeutics Letter by extensive literature searches and verification by both the authors and the editorial board. In addition this Therapeutics Letter was submitted for review to 40 experts and primary care physicians in order to correct any inaccuracies and to ensure that the information is concise and relevant to clinicians.