

EFFECT OF A HIGH NUTRIENT DENSITY DIET ON LONG-TERM WEIGHT LOSS: A RETROSPECTIVE CHART REVIEW

Barbara Sarter PhD; T. Colin Campbell, PhD; Joel Fuhrman, MD

Background • A high nutrient density (HND) vegetable-based diet offers a dietary model extremely low in saturated fat as well as refined carbohydrates and emphasizes a liberal intake of fresh fruits, vegetables, beans, and nuts. We conducted a retrospective chart review of patients who came to a family practice office seeking nutritional counseling for weight loss. All of these patients were prescribed an HND diet in an extended counseling session with a family physician.

Methods • A convenience sample (N=56) of all patients seeking dietary counseling for weight loss from a family practice physician in a 3-year period was included in the chart review. No personal identifying data were recorded. The initial counseling sessions averaged 1 hour in length. Patients were provided with a sample HND daily meal plan and recipes and with verbal and written information about the rationale for the diet. Data recorded from patients' charts at 6-month intervals for up to 2 years of follow-up (when available) included weight, blood pressure, total cholesterol, high-density lipoprotein (HDL) cholesterol, low-density lipoprotein (LDL) cholesterol, triglycerides, and cholesterol:HDL ratio. Non-parametric statistical testing using the Friedman rank order (exact) test for *k*-related samples was conducted. A follow-up survey on adherence and medication use was completed by 38 patients.

Results • Of the 33 patients who returned for follow-up after 1

year, the mean weight loss was 31 lbs ($P=.000$). Of the 19 patients who returned after 2 years, the mean weight loss was 53 lbs ($P=.000$), mean cholesterol fell by 13 points, LDL by 15 points, triglycerides by 17 points, and cardiac risk ratio dropped from 4.5 to 3.8. Changes in systolic and diastolic blood pressure were highly significant at all follow-up time intervals ($P\leq.001$). There was a significant correlation between adherence and degree of weight loss ($P=.011$).

Conclusions • Weight loss was sustained in patients who returned for follow-up and was more substantial in those who reported good adherence to the recommendations. However, many patients were lost to follow-up. Favorable changes in lipid profile and blood pressure were noted. An HND diet has the potential to provide sustainable, significant, long-term weight loss and may provide substantial lowering of cardiac risk in patients who are motivated and provided with extended one-on-one counseling and follow-up visits. Development of tools to aid in patient retention is an area for possible further study. Clinical trials with long-term follow-up are needed to further test the therapeutic potential and to examine adherence and follow-up issues related to this dietary approach. An HND diet as demonstrated with this group may be the most health-favorable and effective way to lose weight for appropriately motivated patients. (*Altern Ther Health Med.* 2008;14(3):48-53.)

Barbara Sarter, PhD, is an associate professor of family medicine in the University of Southern California, Keck School of Medicine, Los Angeles. **T. Colin Campbell, PhD**, is a professor of nutritional sciences at Cornell University, Ithaca, New York. **Joel Fuhrman, MD**, is in private practice at the Hunterdon Medical Center, Flemington, New Jersey.

The use of dietary measures to reduce weight and decrease cardiac risk is currently an area of great interest and debate. Reported increases in triglyceride and insulin levels and decreases in HDL associated with traditional low-fat/high-carbohydrate diets have led to increased interest in high-fat/high-protein/low-carbohydrate

diets.¹³ However, many clinicians are concerned about the long-term effects of a high protein diet on cardiac risk. A recent dietary analysis of 113 230 person years showed that diets higher in animal protein had significant life-shortening effects. The authors state, "even more predictive of both cardiovascular and cancer mortality were the additive effects of low carbohydrate-high protein scores."^{4(p580)}

While most weight loss interventions focus on some preferred ratio of macronutrients (fat, carbohydrate, and protein), they do not typically focus on the micronutrient density of food. Micronutrients (vitamins, minerals, fibers, and phytochemicals) do not contain calories. A sensible alternative to high-protein diets, diets focusing simply on lowering fat intake, or calorie counting/caloric restriction dieting, which has a poor success rate,

is a high nutrient density (HND), vegetable-based diet. A high intake of vegetation is more consistent with the preponderance of evidence linking increased consumption of unrefined plant foods with lower rates of heart disease.^{5,6} Considerable evidence suggests that a diet high in natural plant foods and low in saturated fat is effective for long-term weight control.⁷ Evidence from prospective cohort studies indicates that a high consumption of plant-based foods such as fruit, vegetables, nuts, and seeds is associated with a significantly lower risk of coronary artery disease, stroke, and cancer.⁸ A recent randomized trial comparing an HND (vegetable/fruit/nut-based) diet to a more grain-based vegetarian diet found that LDL-C and LDL:HDL-C were both significantly lowered on the HND diet, by 35% and 30% respectively, with no decrease in HDL or increases in triglycerides.⁹ More and more evidence has accumulated to support the concept that micronutrient deficits can not only contribute to disease but fuel overeating behavior.¹⁰ In a 12-year prospective cohort of 74 063 female nurses conducted in the Nurses' Health Study, those with the largest fruit and vegetable intake had the most favorable weight.¹¹ Recently released national guidelines lend more support to this dietary approach. The most recent USDA guidelines, Dietary Guidelines for Americans 2005, recommend eating more nutrient-dense foods such as fruits, vegetables, and whole grains.¹²

In our practice, therefore, we emphasize the consumption of foods with a high nutrient density, defined as a high ratio of total micronutrients to calories (macronutrients). This is a vegetable-based approach rather than a grain-based or meat-based dietary plan, both of which have significant drawbacks. Vegetables, beans, and fruits are not only rich in micronutrients that protect against disease but are relatively low in calories and high in water and fiber content. Incorporating substantially more of them in the diet can increase nutrient density, promote satiety, and decrease caloric intake. The high nutrient, vegetable-based diet is low in saturated fat and refined carbohydrates and emphasizes a liberal intake of fresh fruits, vegetables, beans, and nuts. In an HND diet, a liberal intake of vegetables is emphasized because vegetables have the highest nutrient-per-calorie density. Although animal products are not excluded, they are minimized, along with processed foods and oils, in favor of natural plant foods, grouped into 4 categories: unlimited, limited, more limited, and off limits (as much as possible) based on their micronutrient levels per-calorie density. These categories are further described below:

Unlimited—All raw vegetables, green vegetables (steamed or frozen), beans/legumes (canned or cooked), fresh fruit, bean sprouts, eggplant, mushrooms, onions, tomatoes, cauliflower;

Limited (1 serving daily)—High starch vegetables (potatoes), grains, breads, cereals, dried fruits, nuts, seeds;

More limited—Fat-free dairy (12 oz maximum per week), animal products (12 oz maximum per week); and

Off limits as much as possible—Fruit juice, sweets, white flour, cheese, oils.

Patients are taught not only the weight-loss benefits of an HND diet but also that combining a high fruit and vegetable

intake with a low intake of saturated fat and less salt can substantially lower the risk of common diseases and the associated increased mortality. Our message is that there is strong evidence to show that combining lower saturated fat intake and low salt intake with a high consumption of high-nutrient plant food can most effectively achieve longevity, protection against disease, and weight loss.¹³

It is our expectation that offering an explanation of the disease-protective qualities of the HND diet along with menu plans, recipes, and provider support will increase the likelihood of adherence. Adherence is a critical feature determining the success or failure of all diets, and motivational and teaching tools, social support, and other factors are critical. Developing and testing methods to improve adherence continue to evolve and are a subject of our ongoing research. Our initial data on the effectiveness of this dietary model for adherent individuals who can maintain it as a dietary model are presented here.

This study begins to answer the question of whether patients would be willing to make these more significant dietary modifications if their healthcare providers advocated them. Can a lengthy office visit during which healthcare providers teach the necessity of making dramatic changes in diet style be effective at convincing patients to make significant changes in their eating patterns? Can such counseling make a dramatic difference in patients' long-term health and weight?

We conducted a retrospective chart review of 56 patients who came to a family practice office seeking nutritional counseling for weight loss. All of these patients were prescribed an HND diet in an extended counseling session with a family physician and were asked to return for follow-up visits at 6-month intervals. Here we present the data obtained from these charts, focusing on documented changes in weight as well as cardiac risk indicators.

METHODS

Design

An outside researcher conducted a retrospective chart review of 56 overweight patients who were placed on the high nutrient density (HND) diet by a family physician specializing in nutritional medicine.

Sample

All overweight patients who came to the office between 2000 and 2003 requesting counseling for weight loss were included in this chart review. "Overweight" was defined as men with body weight >170 lbs and females >130 lbs. Patients ranged in age from 24 to 88 years at the time of the initial consult. The charts of 28 males and 28 females were reviewed. Presenting complaints included diabetes mellitus (15), obesity (16), hypertension (11), coronary artery disease (7), rheumatologic disease (1), hyperlipidemia (1), and depression (1). No personal identifying data were recorded from the charts. Most patients were on minimal medication for treatment of hypertension, heart disease, or diabetes at the time of the initial consultation. Ethnicity was varied, with the majority of patients Caucasian.

Counseling

The initial counseling session averaged 1 hour in length. Patients were provided with a sample daily meal plan, recipes, and verbal and written information about the rationale for the diet. Patients were advised to consume a diet according to the following general rules:

1. Avoid concentrated calories and refined foods. These include sugar, salt, white flour, oils, cheese, butter, and margarine.
2. Eat a large amount and variety of vegetables—raw, steamed, or made into soup. Eat as many vegetables as possible; brightly colored choices should form the cornerstone of the diet. Salad and cooked non-starchy vegetables (such as eggplant, peppers, mushrooms, and tomatoes) can be eaten in unlimited quantities.
3. Eat several servings of a variety of brightly colored fresh fruit, especially berries.
4. Include 1 oz of raw nuts and seeds, and add beans in soups and on salads.
5. The diet should be predominantly vegetarian with limited animal product consumption optional, to a maximum of 12 oz per week.

Data Collection

The following parameters, when available in the chart, were

recorded at 6-month intervals up to 2 years after the initial consultation: weight, systolic blood pressure, diastolic blood pressure, LDL, HDL, total cholesterol, cholesterol:HDL ratio, and triglycerides.

A follow-up survey was conducted by mail or telephone with a total of 38 of the 56 patients for whom chart data had been obtained. The survey asked about adherence and medication changes during the counseling period. We attempted to contact those patients who had not returned for a follow-up visit to ask if they had followed the dietary advice offered at their initial visit but found only 3 such patients, a number inadequate for analysis.

Data Analysis

Non-parametric statistical testing using the Friedman rank order (exact) test for *k*-related samples was conducted. StatXact® software (Cytel, Inc, Cambridge, Massachusetts) was used to calculate Friedman *P* values to test the null hypothesis that the dietary plan had identical effects in each informative block. Table 1 summarizes the original chart review data collected and the statistical analysis.

The follow-up survey results were analyzed to determine relationships between adherence and percentage of weight loss at the time of the last counseling visit (raw data are presented in Table 2). For statistical analysis using the Spearman rank correlation method the original 4 adherence responses on the survey

TABLE 1 Changes in Weight and Cardiac Risk Indicators With High Nutrient Density Diet*

Risk factor	Initial visit	6 months		12 months		18 months		24 months		<i>P</i> value 12 months	<i>P</i> value 18 months	<i>P</i> value 24 months
	Mean (n)	Mean (n)	% change	Mean (n)	% change	Mean (n)	% change	Mean (n)	% change			
Weight	221 (56)	189 (52)	-15%	190 (33)	-14%	188 (22)	-15%	168 (19)	-24%	.0000†	.0000†	.0000†
Systolic BP	158 (50)	141 (42)	-11%	143 (24)	-10%	143 (14)	-10%	143 (14)	-10%	.0000†	.0000†	.0002†
Diastolic BP	93 (50)	85 (42)	-9%	81 (24)	-13%	81 (14)	-13%	84 (14)	-10%	.0009†	.0007†	.0024†
Total cholesterol	196 (44)	185 (28)	-6%	183 (20)	-7%	192 (12)	-2%	183 (10)	-7%	.0449†	.0119†	.0583
LDL cholesterol	122 (41)	108 (26)	-12%	118 (19)	-3%	118 (11)	-3%	107 (10)	-12%	.0586	.0609	.05†
HDL cholesterol	45 (44)	47 (27)	+4%	46 (20)	+2%	44 (12)	-2%	44 (9)	-2%	.5	.57	.43
Cholesterol:HDL ratio	4.5 (42)	3.9 (27)	-12%	4.2 (20)	-5%	4.5 (11)	0	3.8 (10)	-13%	.0091†	.0024†	.0667
Triglycerides	154 (43)	129 (29)	-16%	139 (20)	-10%	127 (12)	-18%	137 (10)	-11%	.0065†	.0127†	.0833

*Friedman rank order test for *k*-related samples. BP indicates blood pressure; LDL, low-density lipoprotein; HDL, high-density lipoprotein.
†*P* values significant at $\leq .05$.

TABLE 2 Percent Weight Loss and Adherence Scores for Each Patient Responding to Follow-up Survey (N=38)

Percent weight loss	Adherence*
6.500	4.000
0.700	2.000
3.800	3.000
27.700	4.000
21.300	4.000
14.500	3.000
15.000	3.000
19.600	3.000
11.000	3.000
21.500	2.000
17.000	3.000
7.800	3.000
2.000	4.000
23.000	3.000
11.800	4.000
5.500	2.000
20.600	3.000
10.500	3.000
3.500	3.000
15.000	2.000
12.800	2.000
-3.500	3.000
13.800	4.000
3.700	4.000
35.000	4.000
18.000	4.000
20.500	3.000
14.600	2.000
26.800	3.000
9.600	3.000
9.900	4.000
19.200	3.000
21.600	3.000
6.400	3.000
30.000	4.000
-1.300	3.000
13.800	1.000
18.700	3.000

*Adherence rated as 1 for "none of the time," 2 for "some of the time," 3 for "most of the time," 4 for "all of the time."

("all of the time," "most of the time," "some of the time," and "none of the time") were collapsed into 2 categories with scores of 1 for some or none of the time and 2 for most or all of the time. Correlations were calculated using the individual patients' actual percentage of weight loss (Table 3) and then in 2 collapsed categories of greater than or less than 10% weight loss, which is a commonly used marker for moderate (and clinically significant) weight loss (Table 4). The Spearman ranked correlation method was used for the data analysis in Tables 3 and 4. Ranks and correlation coefficients of the collapsed 2 categories were calculated using StatXact software.

RESULTS

The *F* statistic was calculated for 12, 18, and 24 months from baseline. Of the 33 patients who returned for follow-up after 1 year, the mean weight loss was 31 lbs ($P=.000$). Of the 19 patients who returned after 2 years, the median weight loss was 53 lbs ($P=.000$), mean cholesterol fell by 13 points, LDL by 15 points, triglycerides by 17 points, and cardiac risk ratio dropped from 4.5 to 3.8. Median weight loss for all 38 patients who returned for at least 1 follow-up visit was 14 lbs. Changes in systolic and diastolic blood pressure were highly significant at all follow-up time intervals ($P\leq.001$). Changes in HDL were not significant.

There was a significant correlation ($P=.049$) between adherence and percentage of weight loss in the 38 patients contacted for follow-up. This correlation was even stronger ($P=.011$) when the weight loss was categorized as less than or greater than 10%. Eleven of 21 patients reporting on medication use during the diet counseling period had discontinued or lowered the dose of their blood pressure medication; 5 reported an increase in medication. Thirteen of 21 reported a decrease or discontinuance of medication for hyperlipidemia, and 3 reported an increase.

DISCUSSION

This is one of the first studies to report long-term, sustained, highly significant reductions in weight and cardiac risk factors in a cohort of patients treated in a private family practice office with a physician-supported dietary intervention. Weight loss appeared to be sustained in those who returned for follow-up. However, many patients were lost to follow-up. This is an issue faced by all weight loss programs and studies. Factors that contribute to this problem warrant future investigation and are presently being developed and studied. Adherence to the diet was significantly associated with greater weight loss in those who reported on the follow-up survey. Additional or increased dosages of medications do not appear to have accounted for the improvements in blood pressure and lipids in this cohort, as a small minority of subjects reported such changes. In fact, medication was decreased or discontinued in the majority of those reporting on follow-up.

Factors not addressed here as areas of our ongoing investigation are availability of healthy meals in local restaurants or for takeout, convenience of purchasable items complying with the diet's recommendations, and the availability of quick meal

TABLE 3 Adherence vs Weight Loss in Patients Responding to Follow-up Survey*

Value	Rank			
	Adherence†	Percent weight loss at last follow-up visit	Percent weight loss at last follow-up visit	
2.000	6.500	23.0	10.0	
1.000	0.700	4.0	3.0	
2.000	3.800	23.0	7.0	
2.000	27.700	23.0	36.0	
2.000	21.300	23.0	31.0	
2.000	14.500	23.0	20.0	
2.000	15.000	23.0	22.5	
2.000	19.600	23.0	28.0	
2.000	11.000	23.0	15.0	
1.000	21.500	4.0	32.0	
2.000	17.000	23.0	24.0	
2.000	7.800	23.0	11.0	
2.000	2.000	23.0	4.0	
2.000	23.000	23.0	34.0	
2.000	11.800	23.0	16.0	
1.000	5.500	4.0	8.0	
2.000	20.600	23.0	30.0	
2.000	10.500	23.0	14.0	
2.000	3.500	23.0	5.0	
1.000	15.000	4.0	22.5	
1.000	12.800	4.0	17.0	
2.000	-3.500	23.0	1.0	
2.000	13.800	23.0	18.5	
2.000	3.700	23.0	6.0	
2.000	35.000	23.0	38.0	
2.000	18.000	23.0	25.0	
2.000	20.500	23.0	29.0	
1.000	14.600	4.0	21.0	
2.000	26.800	23.0	35.0	
2.000	9.600	23.0	12.0	
2.000	9.900	23.0	13.0	
2.000	19.200	23.0	27.0	
2.000	21.600	23.0	33.0	
2.000	6.400	23.0	9.0	
2.000	30.000	23.0	37.0	
2.000	-1.300	23.0	2.0	
1.000	13.800	4.0	18.5	
2.000	18.700	23.0	26.0	
Median	2.000	14.150	23.0	19.3
Sum	69.000	527.900	741.0	741.0
N	38	38	38	38

1-tailed test (positive correlation)

r _s	DF	P value
0.273	38	.049

*r_s indicates correlation coefficient squared; DF, degrees of freedom.
 †Adherence rated as 1 for responses "none of the time" or "some of the time," 2 for "most of the time" or "all of the time."

TABLE 4 Adherence vs Weight Loss Ranked as Less Than or Greater Than Ten Percent*

Value	Rank			
	Adherence†	Percent weight loss at last follow-up visit‡	Percent weight loss at last follow-up visit	
2.000	1.000	23.0	6.0	
1.000	1.000	4.0	6.0	
2.000	1.000	23.0	6.0	
2.000	2.000	23.0	25.0	
2.000	2.000	23.0	25.0	
2.000	2.000	23.0	25.0	
2.000	2.000	23.0	25.0	
2.000	2.000	23.0	25.0	
2.000	2.000	23.0	25.0	
1.000	2.000	4.0	25.0	
2.000	2.000	23.0	25.0	
2.000	1.000	23.0	6.0	
2.000	1.000	23.0	6.0	
2.000	2.000	23.0	25.0	
2.000	2.000	23.0	25.0	
1.000	1.000	4.0	6.0	
2.000	2.000	23.0	25.0	
2.000	2.000	23.0	25.0	
2.000	1.000	23.0	6.0	
1.000	2.000	4.0	25.0	
1.000	2.000	4.0	25.0	
2.000	1.000	23.0	6.0	
2.000	2.000	23.0	25.0	
2.000	1.000	23.0	6.0	
2.000	2.000	23.0	25.0	
2.000	2.000	23.0	25.0	
2.000	2.000	23.0	25.0	
2.000	2.000	23.0	25.0	
2.000	2.000	23.0	25.0	
2.000	1.000	23.0	6.0	
2.000	2.000	23.0	25.0	
2.000	1.000	23.0	6.0	
1.000	2.000	4.0	25.0	
2.000	2.000	23.0	25.0	
Median	2.000	2.000	23.0	25.0
Sum	69.000	65.000	741.0	741.0
N	38	38	38	38

1-tailed test (positive correlation)

r _s	DF	P value
0.371	38	.011

*r_s indicates correlation coefficient squared; DF, degrees of freedom.
 †Adherence rated as 1 for responses "none of the time" or "some of the time," 2 for "most of the time" or "all of the time."
 ‡Weight loss rated as 1 for <10%; 2 for >10%.

instructions or tasty recipes. Food addictions and emotional eating also were not addressed by this study. The goal for healthcare provider–led dietary intervention is to change eating behavior permanently, not temporarily. Only through a well-thought-out and comprehensive patient education program can this plan become a more effective dietary intervention. A motivated provider who can devote the appropriate time and make available the appropriate audiovisual tools, reading materials, and menu plans can achieve success with many patients. A provider who is an example of good health and healthy eating can be even more effective in motivating successful patient change. This latter issue is an area under investigation currently in the Americans In Motion–Healthy Interventions (AIM-HI) study, an ongoing research project funded by the American Academy of Family Physicians.

Changes in lipid profile compared favorably to those that have been reported in other dietary intervention studies. Because of the high intake of nuts, fruits, and vegetables in this diet, data about its possible long-term protective benefits against heart disease and cancer should be collected in future large-scale longitudinal prospective studies of this dietary model. Current evidence suggests that adherence to this diet style, with its higher exposure to antioxidants and phytochemicals, may offer greater cardiac protection than that effected by the change in lipid levels alone.

LIMITATIONS

A retrospective chart review carries with its design many flaws that limit our ability to make generalizations beyond the cohort under study. There were many cases of missing data in the patient charts, and a high percentage of patients were lost to follow-up. These factors limit our ability to generalize even about the total cohort who received the initial counseling intervention. However, the highly significant *P* values associated with this small data set are compelling enough to warrant additional, more tightly controlled studies of the HND diet for both its immediate and long-term benefits. Further development of measures that can be used by healthcare providers to enhance adherence is urgently needed as well.

CONCLUSIONS

Contrary to the common perception that substantial dietary changes are unacceptable to patients, this study suggests that a major overhaul in eating habits is acceptable and possible for a modest proportion of patients when discussed at length in the healthcare provider's office and actively supported by follow-up visits. In fact, it is our contention that patients will likely more successfully comply with dietary improvements when the recommended changes are significant enough to offer visible improvement in weight and lipid parameters and that an HND diet will work better than more modest recommendations.

REFERENCES

1. Foster GD, Wyatt HR, Hill JO, et al. A randomized trial of a low-carbohydrate diet for obesity. *N Engl J Med*. 2003;348(21):2082-2090.
2. Samaha FF, Iqbal N, Seshadri P, et al. A low-carbohydrate as compared with a low-fat diet in severe obesity. *N Engl J Med*. 2003;348(21):2074-2081.
3. Yancy WS Jr, Olsen MK, Guyton JR, Bakst RP, Westman EC. A low-carbohydrate, keto-

- genic diet versus a low-fat diet to treat obesity and hyperlipidemia: a randomized, controlled trial. *Ann Intern Med*. 2004;140(10):69-77.
4. Trichopoulos A, Psaltopoulou T, Orfanos P, Hsieh CC, Trichopoulos D. Low-carbohydrate–high-protein diet and long-term survival in a general population cohort. *Euro J Clin Nutr*. 2007;61(5):575-581.
5. Hu FB, Willett WC. Optimal diets for prevention of coronary heart disease. *JAMA*. 2002;288(20):2569-2578.
6. Ornish D. Was Dr Atkins right? *J Am Diet Assoc*. 2004;104(4):537-542.
7. Hu FB. Plant-based foods and prevention of cardiovascular disease: an overview. *Am J Clin Nutr*. 2003;78(3 Suppl):544S-551S.
8. Finley JW. The antioxidant responsive element (ARE) may explain the protective effects of cruciferous vegetables on cancer. *Nutr Rev*. 2003;61(7):250-254.
9. Jenkins DJ, Kendall CW, Popovich DG, et al. Effect of a very-high-fiber vegetable, fruit, and nut diet on serum lipids and colonic function. *Metabolism*. 2001;50(4):494-503.
10. Rolls BJ, Ello-Martin JA, Tohill BC. What can intervention studies tell us about the relationship between fruit and vegetable consumption and weight management? *Nutr Rev*. 2004;62(1):1-17.
11. He K, Hu FB, Colditz GA, Manson JE, Willett WC, Liu S. Changes in intake of fruits and vegetables in relation to risk of obesity and weight gain among middle-aged women. *Int J Obes Relat Metab Disord*. 2004;28(12):1569-1574.
12. US Department of Health and Human Services, US Department of Agriculture. *Dietary Guidelines for Americans, 2005*. Washington, DC; US Dept of Health and Human Services; 2005. Office. Available at: <http://www.health.gov/dietaryguidelines/dga2005/document/pdf/DGA2005.pdf>. Accessed October 3, 2007.
13. Tucker KL, Hallfrisch J, Qiao N, et al. The combination of high fruit and vegetable and low saturated fat intakes is more protective against mortality in aging men than is either alone: the Baltimore Longitudinal Study of Aging. *J Nutr*. 2005;135(3):556-561.