

# THE MERITS AND PITFALLS OF VEGETARIANISM

| Stephen M. Panebianco, MD |

**H**istorically, health concerns about vegetarianism have been emphasized in the literature, and yet more recently, research has unveiled various associated health benefits.<sup>1</sup> As the awareness of eating beyond the goal of escaping deficiency states to support maximal health has arisen, considering the health benefits of vegetarianism is very worthwhile. At the same time, it is also important to be mindful of potential concerns that can arise with a vegetarian diet. In particular, when your patients have committed to a way of eating that eliminates certain food groups for one reason or another, it becomes clinically important to offer appropriate guidance in a manner in which macronutrient and micronutrient deficiencies are avoided while maximal health is supported. Most importantly, with the perennial media blitz of restrictive diets, some of which carry a vegetarian focus, it is important for clinicians to be fully aware of the merits and pitfalls of a vegetarian diet.

## VEGETARIAN DIVERSITY AND MERITS

The definition of vegetarianism would seem pretty straightforward, and yet, research has demonstrated that various definitions exist. Furthermore, a variance exists within such definitions between individuals, which can make research endeavors challenging. In the strictest sense, a vegetarian does not consume animal-flesh foods and fish, a lacto-ovovegetarian consumes milk and eggs, and vegans eliminate all animal and fish products.<sup>2</sup> With that said, further vegetarian nuances exist, including “organic,” “raw food,” and “junk food” vegetarians. Additionally, some self-proclaimed vegetarians actually consume meat from time to time. A Roper poll revealed that an estimated 4% to 10% of Americans call themselves vegetarian, whereas based on food intake data, fewer than 3% were true vegetarians.<sup>3</sup> Thus, a logical conclusion is for you, the clinician,

to obtain an accurate dietary history that probes beyond asserted definitions to provide worthwhile individualized nutritional guidance.

The health merits of vegetarianism include a lower incidence of obesity; a reduced risk of chronic diseases such as heart disease, hypertension, and type 2 diabetes; a lower death rate from ischemic heart disease; lower blood cholesterol levels; a lower incidence of certain cancers including prostate and colon cancer; and greater longevity.<sup>4,5</sup> However, due to the spectrum of vegetarians and the fact that a teenager’s brand of vegetarianism can be soda, fries, and macaroni and cheese, it is quite clear that certain approaches to vegetarianism do not equate with optimal health and can in fact be fraught with nutritional deficiencies.

## THE PROTEIN FACTOR

It is now well established that a vegetarian and vegan approach to eating can be supportive to optimal health in all life stages if proper planning exists.<sup>6</sup> What about meeting proper protein requirements? To set the record straight, protein needs can be met solely from plant sources when a variety of plant foods are consumed and energy needs are met. Furthermore, plant foods have generally more than 10% of calories from protein. In fact, the percentage of calories from protein for vegetables (not root vegetables) is 20% to 40%, for legumes it is 20% to 37%, and for grains, nuts, and seeds it is 10% to 17%. The exception is fruits, starchy vegetables, and rice, which have less than 10% calories from protein.<sup>3</sup>

There are a variety of protein sources that can serve as meat substitutes, including various soy products and “mock meat” options created from gluten. Furthermore, soy provides an excellent balance of all essential amino acids. Tofu in particular absorbs flavors very well, contains isoflavones that can help support health benefits, and compared to a serving of meat,

tofu has fewer calories, a comparable amount of protein, and contains no saturated fat. It is important, however, to be aware that certain processed tofu products can contain high amounts of sodium, can be devoid of isoflavones and fiber, may have added fat, and products that contain soy isolates or isolated soy protein are best avoided. Tempeh, a textured fermented soybean product, can serve as a meat substitute as well, and it is low in calories and fat, devoid of cholesterol, and it is a good source of fiber, vitamin E, and iron. Due to the fermentation process, tempeh has good digestibility, and unlike soy, it is not associated with gas.<sup>7</sup>

Contrary to prior research, complementary proteins do not need to be consumed at the same meal.<sup>8</sup> It should be known that protein needs are higher during times of growth, pregnancy, lactation, and for athletes and those recovering from certain illnesses. Overall, if a vegetarian is not consuming processed plant foods such as tofu and soy milk, or dairy and eggs, protein needs may need to be increased 10% to 20%, or slightly higher for infants and children due to the reduced digestibility of whole plant foods.<sup>9</sup> This amount of protein is not challenging to obtain, especially if a variety of plant foods is regularly consumed.

## POTENTIAL PITFALLS

What are the potential pitfalls of vegetarianism that you should be mindful of as you support the nutritional health of your patients?

### High Intake of Refined Grain and Highly Processed Foods

Such foods are generally low in fiber, phytochemicals, vitamins, and trace minerals and often contain unhealthy hydrogenated fat, sugar, and salt as a result of processing. Additionally, refined carbohydrates invariably have a high glycemic index, which can lead to various deleterious consequences of hyperinsulinism, in-

cluding a counter-regulatory hormone response to initiate cravings for additional food intake.

Discerning the carbohydrate quality your patients are consuming along with dissuading less desirable, high glycemic index foods is important. It is even better to consider the glycemic load, which factors the amount of carbohydrate with the glycemic index of a specific food. Less desirable refined carbohydrates include both simple carbohydrates (sugars): syrups, jams, jellies and candies; and complex carbohydrates (starches): pasta, bread, baked goods, crackers, and other white flour and white rice products.

Beneficial carbohydrates come from whole plant foods sources such as vegetables, fruits, legumes, whole grains, nuts, and seeds. Such unrefined carbohydrate foods also provide the bonus of fiber, phytochemicals, phytosterols, vitamins, minerals, and essential fatty acids. Although carbohydrates have relentlessly been bashed in the media, carbohydrates are the most efficient energy source that exists.

Lastly, inquiry about sugar intake is an opportune time to educate patients about healthy ways of meeting sweet tooth requirements, such as using agave nectar and black strap molasses.

Low calcium intake can occur, especially if dairy is not included in the diet. It is true that plant foods can contain calcium. However, the quality of plant calcium varies. Much has been learned about dietary calcium from investigating the dietary pattern of vegans, who tend to have lower calcium intakes than omnivorous and lacto-ovovegetarian diets. In fact, a number of studies examining bone health reveal reduced bone density of vegans compared to nonvegetarians. What creates confusion is that people in developing countries are largely eating plant-based diets in which dietary calcium intakes of 300 to 500 mg/day occur, and yet bone health has been shown to be sound. Such a seeming paradox is likely due to genetic differences and other lifestyle factors, including activity levels, sun exposure, and an unrefined diet compared to North American lifestyle realities.<sup>10</sup>

Eliminating all animal food sources can lead to compromised vitamin B<sub>12</sub> status. It is important to note that vitamin B<sub>12</sub> is produced primarily by bacteria; and in

general and in contrast to plant foods, animal foods are good sources of vitamin B<sub>12</sub>. It is true that some plant foods can contain vitamin B<sub>12</sub>, but plant sources are inconsistent and unreliable. Overall, vegetarians—and especially vegans—have been shown to have lower B<sub>12</sub> status compared to nonvegetarians.<sup>11</sup>

### **Replacing Meat With Eggs, Cheese, and Other Dairy Products**

This can lead to a disproportionate and imbalanced diet. There is no doubt that such substitutions can provide high-quality protein, but such protein sources do not supply iron in a bioavailable form similar to meat. Furthermore, dairy is low in iron and can inhibit the absorption of iron, to lead to iron deficiency anemia. Also, iron bioavailability in eggs is poor, and nonmeat iron sources contain iron in a nonheme state, which is more susceptible to inhibitors of iron absorption such as phytate, calcium, tannins from tea, and fiber.<sup>12</sup>

### **Avoiding Plant Sources of Fat**

This fact underscores the qualitative difference of fats from various sources and the fact that certain fats serve vital health functions. In fact, vegetarian diets that contain less than 15% of calories from fat can adversely impact on growth and development of children and can compromise the health of pregnant and lactating women who have high-energy needs.

A low-fat orientation can be very problematic by providing insufficient omega-3 fatty acids. Since vegetarians by definition do not consume fish, which provides a direct source of the important longer-chain omega-3 fatty acids, docosahexaenoic acid (DHA-22: 6 n-3) and eicosapentaenoic acid (EPA-20: 5 n-3), the dietary shorter-chain omega-3 fatty acid alpha-linolenic acid (ALA-18: 3 n-3), which can be elongated into the longer-chain omega-3 fatty acids, becomes very important for vegetarians. However, the conversion of dietary ALA to EPA is approximately 5% to 10%, and generally only less than 2% to 5% of ALA is converted to DHA. Also, certain enzymes that are needed for the creation of long-chain essential fatty acids require pyridoxine, biotin, copper, magnesium, and zinc. Thus, total omega-3 fatty acid requirements may be higher for vegetarians than for nonvegetarians.<sup>13</sup>

ALA sources include but are not limited to walnuts, flax seed, hemp, chia seeds, dark greens, and tofu.

It is important to note that proper fat intake is vital for the absorption of fat-soluble vitamins and many phytonutrients. Also, high-fat plant foods are great sources of sterols, vitamin E, and trace minerals, along with a wide variety of phytochemicals. Lastly, whole plant food sources of quality fats include nuts, seeds, avocados, olives, and soy products. Trace mineral absorption can be compromised, including iron and zinc, due to the high phytate and fiber content that can occur in vegetarian diets.<sup>12</sup>

Vegetarian and other restrictive diets in adolescents in particular can overshadow an underlying eating disorder. It is important to accurately assess the specific dietary patterns of adolescents, who choose a vegetarian approach to eating for potential unhealthy, imbalanced, and restrictive dietary patterns and coexisting eating disorders.<sup>14</sup> Self-reported vegetarian college women may be more likely to display disordered eating attitudes and behaviors than nonvegetarians.<sup>15</sup>

## **GENERAL RECOMMENDATIONS FOR VEGETARIANS**

### **Whole Plant Foods**

Whole plant foods should be the foundation of a vegetarian diet. Such foods include whole grain breads, pastas and cereals; tofu; nondairy soy; grain or nut beverages; legumes; vegetables; and fruits. If packaged foods are chosen, such products should have minimal to no added fat or sugar. From a glycemic index and overall nutritional perspective, the best grain choices in descending order of preference include intact whole grains, followed by cracked, rolled, shredded, stone ground, flaked, and puffed.<sup>10</sup>

### **To Support Calcium Status**

Several daily servings of calcium-rich plant foods are indicated. Quality calcium sources include low-oxalate greens such as kale, broccoli, collards, bok choy, and okra, which provide highly bioavailable calcium; calcium-set tofu, fortified fruit juices, and cow's milk, which provide good calcium bioavailability; and fortified soy milk, sesame seeds, almonds, and most legumes, which provide calcium with moderate bioavailability.<sup>16</sup>

Other calcium-rich plant foods include figs, certain seaweeds, and several calcium-fortified foods such as soy yogurt, blackstrap molasses, almonds and almond butter, and some cereals. Vegetables with high oxalate content such as spinach, rhubarb, beet greens, and Swiss chard should not be considered good sources of bioavailable calcium.

Overall, the easiest way to insure sufficient calcium intake on a plant-based diet is to use the combination of calcium-fortified foods and calcium-rich plants along with selecting a variety of calcium-rich foods throughout the day to support absorption. The advantage of getting your calcium from plant foods is that other bone-supporting nutrients will be present, such as vitamin C, vitamin K, folic acid, magnesium, potassium, and boron, along with protective phytochemicals.<sup>3</sup>

### **To Support Vitamin B<sub>12</sub> Status**

To meet recommended intakes, vitamin B<sub>12</sub>-fortified foods or supplements should be recommended for all vegans, and for lacto-ovo vegetarians over the age of 50. Animal sources of B<sub>12</sub> are not reliable for those over 50 years of age because the ability to cleave B<sub>12</sub> from its protein-bound form declines with age. Thus, patients above 50 years of age need fortified foods, nondairy milks, meat analogs, and ready-to-eat cereals to meet B<sub>12</sub> requirements.<sup>4</sup>

Elevated homocysteine from B<sub>12</sub> deficiency could theoretically counter any cardio-protective effects expected from of a vegetarian diet. To get sufficient vitamin B<sub>12</sub> from foods or supplements, vegans require at least three mcg/day in fortified foods in two or more meals, 10 mcg of supplemental B<sub>12</sub> daily, or 1,000 mcg B<sub>12</sub> weekly. Seaweed, fermented foods, and organic vegetables are not reliable sources of vitamin B<sub>12</sub>.<sup>10,11</sup>

Reliable sources of B<sub>12</sub> for vegans include fortified foods such as fortified nutritional yeast (check the label), cereals, nondairy beverages, meat analogues, as well as supplements, with the goal of at least three mcg per day. A regular source of vitamin B<sub>12</sub> is vital for pregnant and lactating women and for breastfed infants if the mother's total vitamin B<sub>12</sub> intake is insufficient.<sup>4</sup>

### **Trace Minerals**

Supporting proper trace mineral status is important.

**To Support Iron Status.** Regularly include vitamin C and other organic acids from fruits and vegetables when plant sources of iron are consumed to enhance the absorption of iron. Note that the recommended intake of iron is 1.8 times higher for vegetarians compared to nonvegetarians, and to improve iron absorption by decreasing phytate content of plant foods, consider soaking, sprouting, and yeast leavening and fermenting. Incorporate iron-rich plant sources such as legumes, seeds, nuts, dried fruits, blackstrap molasses, and iron-fortified foods such as meat analogs and breakfast cereals. Cooking in a cast-iron skillet can also increase the iron content of food appreciably. Lastly, if tannin-rich teas are a regular part of a vegetarian diet, consume them separately from plant sources of iron.<sup>17,18</sup>

**To Support Zinc Status.** Note that zinc bioavailability and amounts tend to be lower in plant foods compared to animal sources. Also, calcium and phytates can inhibit zinc absorption, which can be offset by soaking legumes and sprouting grains. Yeast-leavened breads and fermenting can also reduce the binding of zinc to phytate to increase zinc bioavailability. Regular intake of zinc-rich foods such as whole grains, legumes, nuts, seeds, as well as zinc-fortified foods is important.<sup>19</sup>

**To Support Iodine Status.** Note that vegans who avoid iodized salt may be at risk for iodine deficiency. Also, foods containing natural goitrogens such as soybeans, cruciferous vegetables, sweet potatoes, millet, and raw flaxseed may reduce iodine uptake. However, this generally occurs only with the backdrop of overall low iodine intake.<sup>20</sup> The RDA of iodine (150 mcg) can easily be obtained with one-half teaspoon of iodized salt or one-tenth teaspoon of kelp powder daily. Contrary to popular belief, sea salt and soy salt and tamari are generally not good sources of iodine. Overall, the iodine content of plant foods depends on the iodine content of soil, and interestingly, dairy products can contain iodine because of iodine-containing disinfectants.<sup>3,21</sup>

### **Omega-3 Fatty Acids and Other Healthy Fats**

Consistent intake of omega-3 fatty acids and other healthy fats is important. In general, three to five grams of ALA should be sufficient in a 2,000-calorie diet, and strong consideration should be given to encouraging omega-3 fatty acid supplementation from reliable DHA/EPA sources, especially for pregnant and lactating women. Aside from quality fish oil supplements and using omega-3 rich oils such as flax and canola oil, DHA-rich eggs can provide 60 to 150 mg DHA per egg, and microalgae supplements can also provide DHA in respectable quantities.

To attenuate omega-6 fatty acid intake, your patients should avoid omega-6 oils such as safflower, sunflower, grapeseed, and corn oil, as well as cottonseed, sesame and soy oils, and the benefits of flax seed, canola, and extra virgin olive oils should be pursued.

Select at least two or three servings of fat-rich plant foods each day, including at least one to two servings of nuts and seeds. Seeds in particular are a primary source of polyunsaturated fats, while nuts are a primary source of monounsaturated fats, with the exception of walnuts, which are a good source of omega-3 fatty acids.

### **To Support Vitamin D Status**

Vitamin D status is important. Sun exposure to the face, hands, and forearms for 10 to 15 minutes per day is sufficient for light-skinned people, whereas darker-skinned people require more. Also, as aging occurs, more sun exposure is needed to convert vitamin D to its active form.

Be mindful of foods that are fortified with vitamin D, including cow's milk, some brands of soy milk, and other fortified nondairy beverages, as well as some breakfast cereals, and keep in mind that vitamin D absorption decreases with age. Vitamin D intake is similar with lacto-ovo vegetarians and nonvegetarians but is lower in vegans. Lastly, vitamin D2 (ergocalciferol) from plants is only about 60% as bioavailable as animal-derived vitamin D3 (cholecalciferol).<sup>3,4</sup>

### **IN SUMMARY**

In order to provide individualized dietary guidance to your vegetarian patients—and because of the wide variety of self-pro-

claimed vegetarians—it is important to accurately discern the specific foods that your patients are excluding. The dietary pattern of adolescent vegetarians in particular should be thoroughly assessed, including exploring for potential underlying unhealthy food relationship issues. In general, vegetarians should be striving for eight or more servings of fruits and vegetables per day, two to three servings of legumes per day, and a wide variety of varied, colored produce to maximize phytochemical intake. Protein needs can be met solely from plant sources when a variety of plant foods are consumed and energy needs are met. Legumes are excellent protein sources, and soy in particular contains an excellent balance of all amino acids. However, soy isolates or isolated soy proteins are best avoided. The value of nuts and seeds, which provide important trace minerals, vitamin E, and healthy oils, should not be underestimated. In terms of grains, five or more servings a day are recommended, and the best grains are whole and intact. It is important to factor in vitamin B<sub>12</sub> needs, especially for vegans and lacto-ovo vegetarians over the age of 50. Encouraging omega-3 fatty acid intake, being mindful of quality plant calcium sources, and understanding the means of enhancing trace mineral absorption (especially iron, zinc, and iodine) is also of value. Additionally, appreciating the importance of vitamin D status, especially in vegans and with aging, is important, and emphasizing water and tea as the predominant beverage is advised. Lastly, dietary realities are one of a number of variables that impact on health quality, and vegetarians—like all your patients—should be encouraged to engage in regular and appropriate physical exercise, to institute a daily stress reduction and mind quieting prac-

tice, and to find ways to connect to a sense of inner meaning and purpose.

## REFERENCES

1. Leitzmann C. Vegetarian diets: what are the advantages? *Forum Nutr.* 2005;57:147-156.
2. Haddad E, Tanzman JS. What do vegetarians in the United States eat? *Am J Clin Nutr.* 2003;78(suppl):626S-632S.
3. Davis B. Cutting-edge vegetarian nutrition. Presented at: Nutrition and Health: State of the Science & Clinical Applications Conference; March 6-9 2005; Tucson, AZ.
4. American Dietetic Association and Dietitians of Canada. Position of the American Dietetic Association and Dietitians of Canada: vegetarian diets. *J Am Diet Assoc.* 2003; 103:748-765.
5. Key TJ, Fraser GE, Thorogood M, et al. Mortality in vegetarians and nonvegetarians: detailed findings from a collaborative analysis of 5 prospective studies. *Am J Clin Nutr.* 1999;70(suppl):516S-524S.
6. Haddad EH, Sabate J, Whitten CG. Vegetarian food guide pyramid: a conceptual framework. *Am J Clin Nutr.* 1999;70(suppl): 615S-619S.
7. Hottinger G. *Exploring Substitutes for Meat.* Dr. Andrew Weil's Self Healing: Creating Optimum Health for Your Body and Soul, July 2006.
8. McDougall J. Plant foods have a complete amino acid composition. *Circulation.* 2002; 105:e197.
9. Messina V, Mangels AR. Considerations in planning vegan diets: children. *J Am Diet Assoc.* 2001;101:661-669.
10. Davis B. Vegetarian nutrition in practice: big blunders, simple solutions. Presented at: Nutrition and Health: State of the Science & Clinical Applications Conference; May 1-3 2006, New York, NY.
11. Antony A. Vegetarianism and vitamin B-12 (cobalamin) deficiency. *Am J Clin Nutr.* 2003;78:3-6.
12. Hunt J. Bioavailability of iron, zinc, and other trace minerals from vegetarian diets. *Am J Clin Nutr.* 2003;78(suppl):633S-639S.
13. Davis B, Kris-Etherton P. Achieving optimal essential fatty acid status in vegetarians: current knowledge and practical implications. *Am J Clin Nutr.* 2003;78(suppl): 640S-646S.
14. Perry CL, Mcguire MT, Neumark-Sztainer D, Story M. Characteristics of vegetarian adolescents in a multiethnic urban population. *J Adolescent Health.* 2001;29:406-416.
15. Klopp SA, Heiss CJ, Smith HS. Self-reported vegetarianism may be a marker for college women at risk for disordered eating. *J Am Diet Assoc.* 2003;103:745-747.
16. Weaver CM, Proulx WR, Heaney R. Choices for achieving adequate dietary calcium with a vegetarian diet. *Am J Clin Nutr.* 1999;70(suppl):543S-548S.
17. Gibson RS, Donovan UM, Heath AL. Dietary strategies to improve the iron and zinc nutriture of young women following a vegetarian diet. *Plant Foods Hum Nutr.* 1997;51:1-16.
18. Dunham L, Kollar LM. Vegetarian eating for children and adolescents. *J Pediatr Health Care.* 2006;20:27-34.
19. Hunt JR, Matthys LA, Johnson LK. Zinc absorption, mineral balance, and blood lipids in women consuming controlled lacto-ovo vegetarian and omnivorous diets for 8 wk. *Am J Clin Nutr.* 1998;67:421-430.
20. Lightowler HJ, Davies GJ. Iodine intake and iodine deficiency in vegans as assessed by the duplicate-portion technique and urinary iodine excretion. *Br J Nutr.* 1998;80: 529-535.
21. Krajcovicova-Kudlackova M, Buckova K, Klimes I, Sebkova E. Iodine deficiency in vegetarians and vegans. *Ann Nutr Metab.* 2003;47:183-185.

---

**Stephen Panebianco, MD**, completed a Residental Fellowship at the University of Arizona's Program in Integrative Medicine. He is board certified in Family Medicine and Holistic Medicine, and specializes in Integrative and Mind/Body Medicine.