

Vegetarian food guide pyramid: a conceptual framework^{1,2}

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ABSTRACT The purpose of this article and the accompanying vegetarian food guide pyramid graphic is to provide the conceptual framework for the development of a new and unique food guide. Food guides for vegetarians have tended to be adaptations of guides developed for the general nonvegetarian population instead of being designed to emphasize the healthy components of vegetarian dietary patterns. A subcommittee of the organizers of the *Third International Congress on Vegetarian Nutrition* began a process that led to the development of a pyramid-shaped graphic illustration and a supporting document, both of which were introduced at the congress. The 5 major plant-based food groups (whole grains, legumes, vegetables, fruit, nuts, and seeds) form the trapezoid-shaped lower portion of the pyramid. Optional food groups, which may be avoided by some vegetarians (vegetable oils, dairy, eggs, and sweets), form the smaller, separate, triangle-shaped top portion of the pyramid. The supporting document discusses the concepts that affect vegetarian food guidance and the rationale for selecting the food groups. It is hoped that this framework will provide the impetus for further research and discussion and will lead to the development of a guide that is nutritionally adequate, is conducive to good health, and can be adopted by vegetarians of diverse eating practices. *Am J Clin Nutr* 1999;70(suppl):615S–9S.

KEY WORDS Food guide pyramid, vegetarian, vegan, dietary guidelines, plant-based diet

INTRODUCTION

In preparation for the *Third International Congress on Vegetarian Nutrition*, a subcommittee of the organizers began a multi-stage process for developing a new vegetarian food guide to be introduced at the congress. Their goal was to continue the tradition within the congress of affording opportunities for practical considerations related to food guidance and recommendations for optimum vegetarian practices. At the first congress, Jacobs and Dwyer (1) and Johnston (2) presented guidelines for feeding vegetarian children and counseling pregnant vegetarians, respectively. Mutch (3) reviewed and evaluated several vegetarian food guides. Guidelines for both vegetarian and vegan dietary patterns were developed by Haddad (4) and introduced at the second congress. Serving sizes and the numbers of servings recommended to meet nutrient requirements were included in the guidelines but were not accompanied by a graphic illustration.

Food guides for vegetarians have tended to be adapted from guides developed for nonvegetarians, such as the US Department

of Agriculture's food guide pyramid (5), and in which flesh foods (meat, poultry and fish) are eliminated from the high-protein food group (6, 7). According to the strictest definition, a vegetarian diet excludes all animal foods, which means that milk, dairy products, and eggs are completely eliminated from their respective food groups. Some guides include soy beverages in the dairy food group as an alternative to milk. Food guides developed for diets that include animal foods may not be suitable for vegetarian eating styles because of differences in food-group construction, the relative proportions and emphasis placed on the groups, and the nutrient composition of the groups.

Typically, food guides have translated nutritional standards into guidelines for making daily food intake meet nutritional requirements. Nutrient standards are based on data derived from studies involving nonvegetarian diets and are targeted to the general population, which is primarily nonvegetarian in the United States and other developed countries. For additional consideration, we propose that studies conducted in healthy vegetarian populations provide valuable and valid information that should also be used in developing guidelines for healthful eating.

The purpose of this article is to describe the process and present the conceptual framework and accompanying vegetarian food guide pyramid graphic that evolved as a result of the subcommittee's efforts. This document is meant to serve as a focus for ongoing study and discussion among scientists, health professionals, and vegetarians from different traditions to further develop and refine guidelines that promote health and prevent disease. It is hoped that the guide, once completed, can be adopted by philosophically diverse vegetarians and be helpful to those who wish to make the transition to vegetarian, or at least more plant-based, diets.

The vegetarian diet as a model for healthful eating

The rationale for presenting the vegetarian diet as a model for healthful eating and for developing appropriate guidelines is as follows.

- 1) If proper guidelines are applied, vegetarian diets can promote adequate growth and development and meet the nutritional needs of healthy individuals throughout the life cycle (8–11).

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TABLE 1Summary of questionnaire questions and responses from the contributors. Responses listed are those that were mentioned most frequently by respondents¹

Question	Responses
In developing the guide, which objective is most important?	Develop a guide that: ² 1) Is applicable to diverse vegetarian practices 2) Helps reduce risk of chronic disease 3) Meets the RDAs for nutrients 4) Helps persons who want to become vegetarian
Should the guide be designed for use in developed countries, developing countries, or both?	The guide must be primarily applicable to developed countries.
What influence should epidemiologic data have on the guide's development?	Epidemiologic data should be considered and take precedence over other types of data.
What influence should the RDAs have on the guide's development?	The RDAs should be met. More recent data must also be considered when available.
What criteria should be used in defining food groups?	Food groups should be categorized the way they usually are.
What food categories should be used?	Grains, legumes, vegetables, fruit, nuts, milk.
Should all types of foods items (eg, whole and processed) be included in the food groups?	Yes, but whole foods should be emphasized.
Should a point system be used to evaluate foods?	No, because it would be too complicated to use on an everyday basis.
What graphic format should be utilized? Pyramid, plate, pie, table of foods, tree, or other?	Pyramid

¹RDA, recommended dietary allowance.²Listed in order of priority given by respondents.

- 2) Dietary patterns of vegetarians have been observed and duly described and the data are available in the scientific literature (12–19).
- 3) Epidemiologic studies in several Western countries such as the United States, United Kingdom, and Germany have documented lower rates of heart disease, diabetes, cancer and other chronic conditions in vegetarians than in the general omnivorous population (12–19). Vegetarian diets are associated with lower body weight (12) and lower blood pressure (20) than are nonvegetarian diets. Seventh-day Adventist vegetarians living in California have lower age-specific mortality rates and higher longevity than do nonvegetarians (15).
- 4) Results of current epidemiologic and experimental research indicate that plant-based dietary patterns lower the risks of diet-related chronic diseases, ie, heart disease and cancer (21–24). The protective effects of plant foods are thought to be due to various compounds found in them, only some of which are nutrients in the classic sense (24, 25).

PROCESS AND PRODUCT

The authors of this article comprised the congress subcommittee and initiated a process to develop a new and innovative vegetarian food guide. To obtain input and ideas on the structure and format of the guide, we developed and sent a questionnaire, composed of open-ended questions, to 13 individuals who were either researchers from academia or practitioners with expertise in vegetarian nutrition (26). This international group of contributors was selected to represent diverse vegetarian philosophies and prac-

tices. Responses and comments from the 12 returned questionnaires were compiled and tabulated. A synopsis of the questions and the most common responses and comments obtained from respondents are shown in **Table 1**. Based on these responses, an initial draft of the supporting script was written and various graphic illustrations were designed and shared with the contributors. During the congress, the contributors in attendance (12 individuals including the authors) met to discuss the issues and select the graphic illustration in a consensus-building process.

The food guide graphic

The pyramid-shaped graphic was selected because of its current usage and familiarity to consumers. The food groups that should appear on the pyramid were identified and arranged in sections on tiers on the basis of their relative quantitative contribution to the diet (**Figure 1**). The 5 major plant-based food groups (whole grains, legumes, vegetables, fruit, nuts, and seeds) form the trapezoid-shaped lower portion of the pyramid. Four optional food groups (vegetable oils, dairy products, eggs, and sweets) form the smaller, separate, triangle-shaped top portion of the pyramid. Depending on the philosophical values and health beliefs of individual vegetarians, one or more of these optional food groups can be included in the diet. The consensus reached was that this separate depiction of optional good groups would facilitate the graphic's adoption and application by vegetarians with diverse eating patterns. It was also decided that a statement must appear on the graphic about the necessity of vitamin B-12 supplementation for individuals consuming vegan diets. It was discussed, but not decided, to add a statement saying that although

the dairy group is optional, some nutrients dairy products provide (eg, protein and calcium) are not, and these must be considered in the total diet. Some of the food selections that may be included in the food groups are listed in **Table 2**.

Lifestyle factors

Because diet is only one of the behavioral factors that influence health, it was decided that other determinants such as physical activity, moderate exposure to sunlight, and water intake should be depicted in association with the food guide. Alcohol was not included in the food guide graphic for the following reasons: 1) most scientific data supporting the health benefits of vegetarian diets are from vegetarian populations that do not consume alcohol, 2) there is no evidence that adding alcohol to the diet of a low-risk vegetarian population will further lower the overall risk of chronic diseases, and 3) the inclusion of alcohol may compromise acceptance of the food guide by a large segment of the target population.

FEATURES OF A HEALTHFUL VEGETARIAN DIET

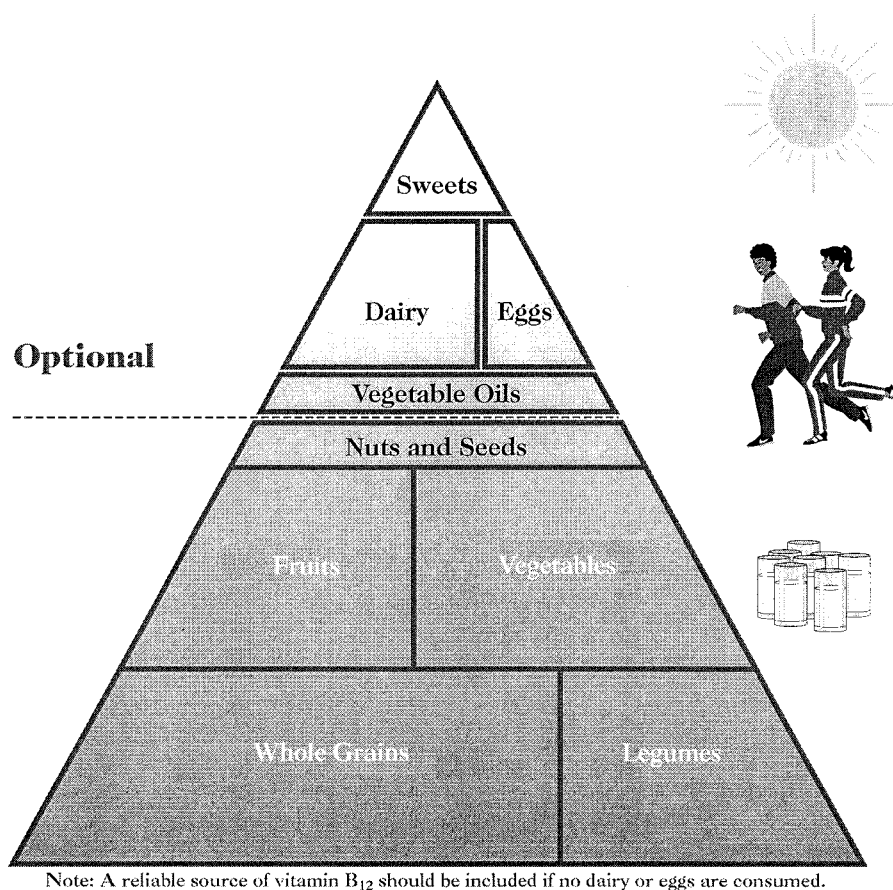
In addition to developing the graphic, the contributors identified selected features of a healthful vegetarian diet and from those formed some principles that should be the basis for food guidance and meal planning. The following is a summary of these concepts and the rationale underlying their selection.

Variety and abundance of plant foods

Although vegetarian diets are typically defined by the exclusion of animal foods, a healthy vegetarian diet is one in which a variety and abundance of plant foods are emphasized. Plant foods include: grains, legumes (including soybeans and soy-based products), vegetables, fruit, nuts, seeds, plant oils, sweeteners, herbs, and spices. In principle, daily consumption of a variety of foods from all the plant groups in quantities to meet energy needs can provide all nutrients needed by humans except for vitamin B-12 and, possibly, vitamin D. Diets containing ample plant foods are low in total and saturated fat and high in fiber, folate, antioxidant nutrients (vitamin C, vitamin E, and carotenoids) and various phytochemicals and protective compounds (24, 27–31).

Unrefined and minimally processed foods

Unrefined and minimally processed foods are emphasized because they contain more vitamins, minerals, and dietary fiber than do refined and processed foods. Although several commonly used food items are effectively enriched and fortified to replace some of the lost nutrients, whole and less-refined plant foods provide nutrients, fiber, and bioactive components not found in their more refined counterparts or in processed foods. More and more is being learned about the importance of these components of plants in physiologic function and disease protection (28, 29).



Note: A reliable source of vitamin B₁₂ should be included if no dairy or eggs are consumed.

Figure 1. Vegetarian food guide pyramid.

TABLE 2

Description of food groups and recommendations for food selection.

Food group and examples of food items	Recommendations
Whole grains Grains: wheat, corn, oats, rice, and millet Grain products: bread, pasta, and tortillas	Select whole-wheat and whole-grain products.
Legumes Beans and peas: soy, pinto, kidney, navy, lima, and garbanzo beans, peas, and lentils Soy and soy products: tofu, soy drinks, and texturized protein foods	Select soy-based milk alternatives fortified with calcium, vitamin D, and vitamin B-12.
Vegetables All vegetables	Emphasize leafy, green and yellow vegetables. Eat both cooked and raw vegetables.
Fruit All fruit	Emphasize whole fruit rather than juice.
Nuts and seeds Nuts: almonds, walnuts, peanuts, and other nuts Seeds: pumpkin, squash, sunflower, and other seeds Butters: peanut, almond, and sesame (tahini)	Eat nuts and seeds raw, dry roasted, or in foods rather than deep-fried.
Vegetable oils Plant oils: canola, corn, olive, and sesame	Emphasize oils high in monounsaturated fatty acids such as olive, sesame, and canola. Limit tropical oils (coconut, palm kernel, and palm oil). Avoid hydrogenated fats.
Milk and dairy Milk, yogurt, and cheese	Emphasize nonfat and low-fat products. If dairy is avoided, ensure that adequate reliable sources of calcium, vitamin D, and vitamin B-12 are consumed.
Eggs	Limit eggs or use egg whites only.
Sweets Honey, syrup (molasses, maple, and carob), sugar, sweeteners, jams, and jellies	Eat sweets in moderation.
Vitamin B-12 Dietary supplements or fortified foods	A reliable source of B-12 (cobalamin) should be included if dairy and eggs are avoided.

Although most vegetables, fruit, nuts, and legumes can be consumed with minimal refinement, this is not the case for foods derived from grains. Whole grains, however, have been associated with a lower risk of heart disease, some cancers, and diabetes (24, 28, 29). A diet based on unrefined and minimally processed foods is more likely to supply the quantities and proportions of substances needed to promote health and prevent disease than one based on refined and processed foods. On the other hand, certain fortified and enriched plant-based products (such as vitamin B-12–fortified ready-to-eat breakfast cereals and calcium-fortified orange juice) may be nutritionally valuable adjuncts to a vegetarian diet for some individuals.

Milk, dairy products, and eggs

Vegetarian diets that include dairy products, eggs, or both furnish all the nutrients required by healthy adults, and in population studies such diets have been shown to be healthful with no need for routine dietary supplementation. Because some dairy products are high in fat and in saturated fat, it is preferable to emphasize nonfat and low-fat products.

Vegan diets, which exclude milk, dairy products, and eggs, require specific guidelines for adequate consumption of vitamin B-12, calcium, and vitamin D. Plant foods are devoid of vitamin B-12 and individuals who avoid all animal foods need a regular and reliable source of the vitamin either from vitamin B-12–fortified foods, vitamin B-12 supplements, or both. Some ready-to-eat breakfast cereals, vegetable-protein products, nutritional yeasts, and milk alternatives are now fortified with vitamin B-12.

Although calcium is widely distributed in plant foods and many leafy green vegetables provide readily bioavailable sources of calcium (32), consuming these foods in amounts adequate to meet

the needs of children, adolescents, pregnant and lactating women, and the elderly could present a problem. Other calcium-rich plant-food items that must be emphasized are tofu made with calcium salts and calcium-fortified fruit juices and milk alternatives.

In the United States, the principal dietary source of vitamin D is milk, which is fortified with the vitamin. Diets that exclude milk may require a supplementary source of vitamin D in the absence of adequate exposure to sunlight. Inadequate exposure is more likely to occur in northern latitudes and during the winter months. Examples of vitamin D–fortified plant foods are some ready-to-eat breakfast cereals and milk alternatives.

Sources of fat and levels of fat intake

Many equate vegetarian diets with low-fat diets. Very-low-fat vegetarian diets have proven helpful in therapeutic approaches to several conditions, and some advocate low-fat vegetarian diets for everyone. Although it is relatively simple to design diets low in total and saturated fat in the context of a vegetarian pattern, this does not imply that all vegetarians consume a low-fat diet. The fat intake of vegetarians varies widely (from 15% to 40% of daily energy) and a wide range of fat intake from plant foods is compatible with a positive health outcome.


Unrefined plant sources of fat such as nuts, seeds, avocados, and olives are consumed in high amounts by some but not all vegetarians (33–35). These foods are sources of unsaturated fats, essential fatty acids, antioxidant nutrients, phytochemicals, and fiber. According to surveys, vegetarians consume more nuts and do so more frequently than do non-vegetarians (34). This is not a recent or a local phenomenon. In India, where there is a millennium of vegetarian tradition, peanuts and peanut oils are a prominent part of the diet. Studies of vegetarians in Western

countries show that 6–15% of their daily energy intake was from nuts. Vegetarian Seventh-day Adventists in California eat nuts more frequently than their nonvegetarian counterparts, and much more frequently than the general population (35).

The Adventist Health Study reported that men and women who consumed nuts ≥ 5 times/wk lowered their risk of heart disease by 50% and increased their life expectancy by several years compared with those who hardly ever ate nuts (16, 33). Experimental trials have shown that specific nuts lower blood lipids, and similar beneficial effects have been reported for olive oil, avocados, and other unrefined, fat-rich plant foods (33–37).

Currently, public health recommendations are to keep total fat intake $< 30\%$ of energy on the basis of data from Western populations, in which most dietary fat is from animal foods, animal fats, and processed, high-fat, snack-type foods. It is not clear if the same recommendations should apply to vegetarians whose dietary fat comes mostly from unrefined plant-food sources.

FUTURE DIRECTIONS

This conceptual framework represents a preliminary effort intended to stimulate discussion among nutrition scientists and health professionals. It may, however, become a futile academic exercise unless the food guide created is comprehended and used effectively by the target population. Although this vegetarian food guide pyramid graphic has a shape similar to that of the US Department of Agriculture (5), the guides differ in their food group categories, the number of food groups included, and the method by which the pyramid is to be followed in daily food selection. Efforts must be directed toward determining the quantities and frequencies of foods needed to insure nutritional adequacy and health benefits. Also needed is the development of sample meal plans to show how the guide may be applied to meal planning for diverse eating styles and differing requirements throughout the life cycle. 

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