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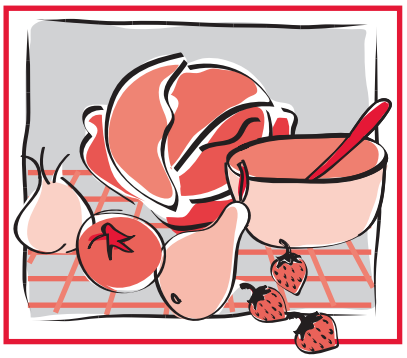

Vegetarian Diets

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by L. Bellows*

A vegetarian is a person who does not eat meat or animal products. However the types of vegetarian diets can vary widely. While some individuals exclude all animal products (vegans), others limit the amount of animal products as part of their total overall diet. Today, in the United States, there are an estimated 4.9 million people who identify themselves as a vegetarian; this is 2.3% of the US population. About 1.4 % of the US adult population is vegan.

Well planned vegetarian diets can be healthful, nutritionally adequate, and may provide health benefits in prevention and treatment of chronic diseases during all phases of the lifecycle, according to the Academy of Nutrition and Dietetics. Vegetarian diets have been associated with lower levels of obesity (body mass index), reduced risk of cardiovascular disease and lower total mortality. Lower LDL cholesterol levels, lower blood pressure, and lower rates of hypertension, type 2 diabetes, and some forms of cancer, have been shown in vegetarians compared to non-vegetarians.

Vegetarians tend to consume fewer overall calories; a lower proportion of calories from fat (particularly saturated fat) and cholesterol; and higher intakes of fruits, vegetables, whole grains, nuts, soy products, fiber, and phytochemicals than non-vegetarians. These features may reduce the risk of chronic disease. Because of the variability in vegetarian diets, it is important for individuals to become familiar with their individual nutritional needs and potential dietary deficiencies.

Types of Vegetarian Diets

Vegetarians have different dietary practices, but most can be categorized into one of the following groups:

Vegans, or **total vegetarians**, eat only plant foods; including fruits, vegetables, legumes (dried beans, peas, and lentils), grains, seeds and nuts.

Lacto vegetarians eat plant foods as well as dairy products, such as milk and cheese.

Lacto-ovo vegetarians eat plant foods, dairy products and eggs. Most vegetarians in the U.S. fit into this category.

Semi-vegetarians don't eat red meat but may include chicken or seafood with plant foods, dairy products and eggs.

Key Nutrients of a Vegetarian Diet

People on vegetarian diets generally receive adequate amounts of most nutrients. However, the following nutrients may be lacking. Vegetarians should make sure they get adequate amounts of these nutrients.

Protein

Protein is needed for growth and maintenance of body tissues. It also is necessary for enzymes, hormones, antibodies and milk production in women who are breastfeeding. Plant sources of protein can provide adequate amounts of essential and nonessential amino acids, if they are reasonably varied and caloric intake is sufficient to meet

Quick Facts

- Following a vegetarian diet can be a healthful way to eat.
- Vegetarians are categorized by which animal foods are restricted in the diet.
- Nutritional requirements are the same for vegetarians and non-vegetarians but some nutrients require special attention.

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Figure 1. Beans are an excellent source of protein.

energy needs. Whole grains, legumes, vegetables, seeds and nuts all contain essential and nonessential amino acids. Textured vegetable proteins and meat analogues, such as tofu and tempeh (usually made from soybeans and fortified with amino acids) are good protein sources. An assortment of plant foods eaten over the course of a day can provide all essential amino acids; thus, complementary proteins do not need to be eaten at the same meal.

Omega-3 Fatty Acids

An increasing body of research shows the many benefits of omega-3 fatty acids. These fats may reduce the risk for cardiovascular disease, improve cognitive function and vision, and act as an anti-inflammatory in the body. The primary sources of omega-3 fatty acids in the diet are fish, organ meats, and DHA-enriched foods such as eggs. Based on these food sources, vegetarians may not get enough omega-3 fatty acids in their diet. However, vegetarians can still boost their omega-3 intake by eating foods like flaxseed, walnuts, canola oil and soy. They can also choose from the increasing variety of DHA-enriched foods sold in the marketplace, such as some soy milks and breakfast bars. Finally, capsule supplements made from DHA-rich microalgae are available, but it is always important to consult a healthcare provider before taking a supplement.

Calcium

Calcium is needed for strong bones and teeth, for normal blood clotting and for normal muscle and nerve function. Most calcium in the American diet comes from milk and milk products. When these foods are avoided, calcium must come from other sources. Dark green leafy vegetables are the plant foods that provide the most calcium.

Certain plant components may inhibit the absorption of dietary calcium. In the context of the overall diet however, this does not appear to be significant. Calcium from low-oxalate vegetable greens (broccoli, bok choy, chinese cabbage, collards, kale) is absorbed as well or better than calcium from cow's milk. Fruit juices fortified with calcium and calcium-set tofu are also good sources of calcium.

Calcium deficiency in vegetarians is rare, and there is little evidence to show that calcium intakes below the Dietary Reference Intake cause major health problems in vegetarians. U.S. recommendations for calcium are relatively high compared to those for populations that eat a more plant-based diet. High levels of animal protein increase urinary loss of calcium. U.S. recommendations are designed to compensate for this. Studies show that vegetarians absorb and retain more calcium from food than do non-vegetarians.

Vitamin D

Vitamin D is required to absorb calcium from the digestive tract and to incorporate calcium into bones and teeth. Few foods contain large amounts of vitamin D. The best sources–fortified milk, egg yolks and liver–are all of animal origin. Therefore, vegetarians, especially vegans, may not get enough.

Sunlight is another source of vitamin D. The body makes vitamin D from sunlight on the skin. People regularly exposed to sunlight can get enough vitamin D without having any come from food. However, sun exposure can be limited by several factors, including dark skin, pollution and northern latitudes. If sun exposure is limited and there are no animal products in the diet a vitamin D supplement is needed.

Vitamin B-12

Vitamin B_{12} is needed for normal red blood cell formation and normal nerve function. The body needs only small amounts and can store it in large amounts. Therefore, a deficiency takes a long time to develop, maybe several years. Once a deficiency does develop, however, it results in irreversible nerve damage. Thus, vegetarians need to pay special attention to this nutrient.

The human form of vitamin B_{12}, Cyanocobalamin, is available from non-animal products such as fortified commercial breakfast cereals, fortified soy beverages, some brands of nutritional yeast and other products. A vegetarian who eats dairy products daily will get enough vitamin B_{12}. Vegans, however, have little or no vitamin B_{12} in their diets and must obtain the vitamin through regular use of a vitamin B_{12} sources such as fortified soy milk or yeast or a vitamin B_{12} supplement.

Iron

Iron combines with protein to form hemoglobin, the substance in the blood that carries oxygen and carbon dioxide. An adequate intake of iron is necessary to prevent anemia. Many Americans, both meat-eaters and vegetarians, have a difficult time consuming enough iron.

Iron is found in animal and plant foods, but the iron in animal foods is more easily absorbed by the body. Also, the iron in plant foods may be less available to the body because of their high fiber content. Fiber is not absorbed into the body. It may tie up minerals, such as iron, so they, too, are not absorbed. For these reasons, vegetarians may be at a higher risk for developing iron deficiency. Because women need more iron than men they especially need to pay attention to iron.

Among plant foods, dark green leafy vegetables have the highest iron content. Dried fruits (such as raisins, apricots, peaches and prunes) also are high in iron. Eat plant sources of iron at the same meal as foods high in vitamin C (Brussels sprouts, strawberries, citrus fruits, broccoli, collard greens, mustard greens, cantaloupe or vitamin C-rich fruit juices). Vitamin C increases the availability of iron in the intestinal tract. When vitamin C and iron are eaten together, more iron is absorbed into the body.

Zinc

As with iron, zinc is a mineral that is present in plant foods but better absorbed from animal sources. As a result, some vegetarian diets may not provide the recommended amount of zinc. Even so, true zinc deficiencies are not usually a concern. Vegetarians can make sure they consume zinc by including foods such as soy products, legumes, grains, cheese and nuts. Like iron, zinc can be better absorbed when eaten in combination with vitamin C-rich foods.

Iodine

Vegans especially who remove certain foods from their diets may be at risk for iodine deficiency. Whereas iodized salt is a source of iodine, kosher and sea salts are not. Besides iodized salt, vegans can get iodine from seaweeds, soybeans, sweet potatoes and cruciferous vegetables such as broccoli and cabbage.

Planning a Nutritious Vegetarian Diet

Vegetarians should follow the diet principles recommended in the *Dietary Guidelines for Americans*. Well-planned vegetarian diets can effectively meet these guidelines and be a health-supporting dietary alternative. The 2010 Dietary Guidelines include adaptions to the healthy eating pattern for lacto-ovo vegetarians and vegans. The recommendations, as outlined in Table 1, for non-vegetarians, lacto-ovo vegetarians, and vegans are similar for fruit, vegetables, grains and dairy. The overall amount of protein is also similar; however, the types of protein foods and amounts for each of these foods vary.

Vegetarian Protein Options

Beans and Peas

Dry beans and peas, as well as lentils, are considered legumes. Vegetarians, as well as meat-eaters, find that legumes are an excellent food to extend or replace meat. Legumes are low in cost, high in nutritive value, and contribute iron and B vitamins to the diet. Like most plant sources their protein quality is low. If small amounts of animal food (milk, eggs or cheese) or other plant foods (such as grains) are included in the diet, they can become valuable contributors to protein needs.

Dry beans: Rich in protein, iron, calcium, phosphorus and potassium. Many varieties of dry beans include black beans, garbanzo beans (also called chick peas), kidney beans, lima beans, navy beans and pinto beans.

Dry peas: Good sources of protein, iron, potassium and thiamin. They are green or yellow and can be purchased split or whole.

Table 1: Daily food guide for vegetarians: Suggested daily servings, based on a 2000 calorie diet, from each of the food groups.

	USDA Food Pattern	Lacto-Ovo Vegetarian Adaption	Vegan Adaption	What counts as a cup or ounce equivalent (oz-eq)?
Fruit	2 cups	2 cups	2 cups	1 cup of fruit or 100% fruit juice, or ½ cup of dried fruit
Vegetables	2.5 cups	2.5 cups	2.5 cups	1 cup of raw or cooked vegetables or vegetable juice, or 2 cups of raw leafy greens
Grains	6 oz-eq	6 oz-eq	6 oz-eq	1 slice of bread, 1 cup of ready-to-eat cereal, or ½ cup of cooked rice, cooked pasta, or cooked cereal
Dairy	3 cups	3 cups	3 cups	1 cup of milk, yogurt, or soymilk (soy beverage), 1 ½ ounces of natural cheese, or 2 ounces of processed cheese. Note: Vegan 'dairy group' is made up of calcium-fortified beverages and foods from plant sources.
Protein Foods	5.5 oz-eq	5.5 oz-eq	5.5 oz-eq	1 ounce of meat, poultry or fish, ¼ cup cooked beans, 1 egg, 1 tablespoon of peanut butter, or ½ ounce of nuts or seeds
Seafood	8 oz/wk			
Meat, Poultry, Eggs	26 oz/wk			
Nuts, seeds, soy products	4 oz/wk			
Eggs		4 oz-eq/wk		
Beans & Peas		10 oz-eq/wk	13 oz-eq/wk	
Soy Products		12 oz-eq/wk	10 oz-eq/wk	
Nuts & Seeds		13 oz-eq/wk	15 oz-eq/wk	

Lentils: Disc-shaped legumes similar in size to peas. They are rich in protein, iron, potassium, calcium and phosphorus.

Soy Products

Soy products include tofu, soymilk, tempeh and other products. All are derived from soybeans and are a rich source of plant-based protein. Protein in soybeans contains as much complete protein as meat and they are a good source of B vitamins and essential fatty acids, including some omega-3s. Soyfoods are generally low in saturated fat and trans fat and are cholesterol free. They also contain isoflavones which may help lower the risk of some chronic diseases. The following are common soy products that you will find in the marketplace:

Soybean: A legume, which is an excellent, inexpensive source of protein and iron. Soybeans are used to make a number of vegetarian substitutions for meat, dairy and eggs.

Soy cheese: A cheese-like product made from soybeans. Soy cheeses come in most of the same varieties as dairy cheeses, such as parmesan, mozzarella and cheddar. However, some soy cheeses are not vegan as they contain the animal protein casein.

Soymilk: A milk-like product made from soybeans, with the same amount of protein and less fat than cow's milk. Not all soymilks are vegan as some contain the animal protein casein.

Tempeh: Made from fermented soybeans, tempeh is a replacement for meat.

Textured Vegetable Protein: Commonly used as a substitute for ground beef; TVP is derived from soy flour.

Tofu: Made from curdled soymilk and pressed into blocks. It is a replacement for meat, eggs and cheese and can be eaten fresh or cooked in many different ways. Tofu is an excellent source of protein. Types and uses of tofu:

- Extra-firm tofu: frying, roasting, grilling or marinating
- Firm tofu: stir-frying, boiling or to use as filling
- Soft tofu: pureeing
- Silken tofu: pureeing, simmering, egg substitution, used in vegan desserts and smoothies

Nuts and Seeds

Nuts are one of the best plant sources of protein. Additionally, they are rich in fiber, folic acid, potassium, antioxidants (vitamin E and selenium) and phytochemicals. Nuts are high in monounsaturated and polyunsaturated fatty acids, including omega 3 fatty acids). Seeds have a similar nutrient profile to nuts, thus they're considered interchangeable with nuts. Because nuts and seeds are high in fat portions should be limited.

Tree nuts: Includes almonds, Brazil nuts, cashews, hazelnuts, macadamias, pecans, pine nuts, pistachios and walnuts.

Seeds: Includes pumpkin, sesame, sunflower, and flaxseed. Seeds have a similar nutrient profile to nuts.

Nut Butters: Peanut butter is the most popular but other nuts and seeds make healthful butters: sunflower, almond, hazelnut and soy.

Summary

A vegetarian diet can be a healthy way to eat. The key is to consume a variety of foods and the right amount of foods to meet your energy and nutrient needs. For vegetarians, it is important to:

- Be conscious of protein-rich foods. Your protein can easily be met by eating a variety of plant foods, such as beans, peas, soy products, nuts, and seeds.
- Eat a variety of fruits and vegetables, especially those that are good sources of vitamins A and C.
- Include whole grains and other fiber rich foods.
- Get enough calcium and vitamin B_{12}.

Well planned vegetarian diets can be healthful, nutritionally adequate, and may provide health benefits in prevention and treatment of chronic diseases during all phases of the lifecycle.

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