BECOMING VEGAN

COMPREHENSIVE EDITION

the complete reference to plant-based nutrition

BRENDA DAVIS, RD and **VESANTO MELINA**, MS, RD

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TABLE 2.3. Estimated contribution of diet to cancer deaths

TYPE OF CANCER	PERCENT OF DEATHS LINKED TO DIET
Prostate	75
Colorectal	70
Breast, endometrial, gallbladder, and pancreatic	50
Gastric (stomach)	35
Lung, larynx, pharynx, esophagus, mouth, and bladder	20
Other	10

Source:[129]

Evidence suggests that diet is the linchpin, accounting for an estimated 30 to 35 percent of all cancers. Beyond food choices, an estimated 25 to 30 percent of cancers (87 percent of lung cancers) are primarily due to smoking, 15 to 20 percent are linked to infections, 10 to 20 percent are triggered by obesity, and 4 to 6 percent are tied to alcohol ingestion. The balance is thought to be caused by a variety of factors, such as radiation, stress, inadequate physical activity, and environmental contaminants.[129]

The degree to which diet serves as a causative factor varies according to the type of cancer. As shown in table 2.3, the impact of diet varies with the cancer type or site and is particularly high in the hormone-related and intestinal (colorectal) cancers prevalent in those following Western diets.

In a laudable effort to reduce the global burden of cancer, the World Cancer Research Fund and the American Institute of Cancer Research (WCRF/AICR) convened two expert panels to determine the strength of the existing evidence linking diet and lifestyle factors to cancer. Foods, food components, supplements, dietary patterns, physical activity, body composition, and body fatness were all factored in and scrutinized. The reports present judgments regarding these factors and their relative impact on cancer risk for seventeen potential cancer sites. Released in 1997 and 2007, these reports are considered the most authoritative and influential in this field to date.[130, 131] WCRF/AICR's Continuous Update Project (CUP) also monitors scientific findings on an ongoing basis and maintains a central database of evidence. This allows the panel to review and revise recommendations as new evidence presents itself.

Table 2.4 (page 46) provides an abbreviated version of the 2007 findings as they relate to six of the cancers most directly impacted by food choices. Evidence listed as "convincing" or "probable" was deemed strong enough to include in public health goals (meant for health professionals) and personal recommendations (meant for communities, families, and individuals). Evidence listed as "limited" or "suggestive" was considered insufficient as a basis for public health goals and personal recommendations, although it was strong enough to show a generally consistent trend toward either reducing or increasing cancer risk.

TABLE 2.4. Dietary and other factors that affect cancer risk

CANCER SITE	EFFECT ON RISK	EVIDENCE: CONVINCING	EVIDENCE: PROBABLE	EVIDENCE: SUGGESTIVE OR LIMITED
Breast	Decreases risk	Lactation	Physical activity (postmenopause)	Physical activity (premenopause)
	Increases risk	Alcoholic drinks		Total fat (postmenopause)
Colorectal	Decreases risk	Foods with fiber,* physical activity	Garlic, milk, calcium in supplements	Nonstarchy vegetables, fruits, foods with folate, fish, foods with selenium, selenium in supplements
	Increases risk	Red meat, processed meat, alcoholic drinks (men), body fatness, abdominal fatness	Alcoholic drinks (women)	Cheese, foods with animal fat, foods with sugar
Esophageal	Decreases risk		Nonstarchy vegetables, fruits, foods with vitamin C	Foods with fiber, foods with folate or vitamin E, physical activity
	Increases risk	Alcoholic drinks, body fatness		Red meat, processed meat at high temperatures, drinks
Lung	Decreases risk		Fruits, foods with carotenoids	Nonstarchy vegetables, foods with selenium, foods with quercetin, selenium in supplements
	Increases risk	Beta-carotene in supplements, body fatness (postmenopause)	Abdominal fatness (postmenopause)	Red meat, processed meat, butter, total fat
Prostate	Decreases risk		Foods with lycopene, foods with selenium, selenium in supplements	Legumes, foods with vitamin E, foods with quercetin, vitamin E supplements
	Increases risk		High-calcium diets	Processed meat, milk or dairy products
Stomach	Decreases risk		Nonstarchy vegetables, fruits	Legumes, foods with selenium
	Increases risk	Salt, salted and salty foods		Processed meat, smoked foods, grilled or barbecued animal foods

Source:[131, 134]

*In the 2007 report, the evidence was probable; however, in 2011, the panel strengthened the judgment to convincing.

CHAPTER 8

Clean, Strong Vegan Eating

A healthy body is a guest-chamber for the soul; a sick body is a prison.

FRANCIS BACON, ENGLISH PHILOSOPHER

Everyone is familiar with the saying "you are what you eat," but few recognize that the food they consume day after day is quite literally what their body is made of. Food is so much more than fuel. It provides the structural materials used to build, renew, and repair body tissues, as well as the raw resources needed to manufacture brain cells, muscles, bones, hormones, and enzymes. The only way people can ever hope to achieve and maintain optimal health is to select food as if it really matters—because it does.

Step one is to maximize the protective capacity of the diet by loading up on the foods that have the greatest potential to reduce disease risk. Step two is to minimize pathogenic factors that contribute to the onset and progression of disease. With each step, care must be taken to ensure nutritional adequacy. This is the essence of clean vegan eating.

Step One: Maximize Protective Capacity

Step one is about making every calorie contribute to health and healing. Fortunately, plant foods are concentrated sources of the dietary components consistently linked with favorable health outcomes. Plants provide antioxidants, phytochemicals, phytosterols, fiber, enzymes, prebiotics, probiotics, essential fats, proteins, carbohydrates, vitamins, and minerals. Like a symphony, these compounds work together to turn off disease-promoting

genes, reduce inflammation, boost immune function, balance hormones, enhance detoxification enzymes, maintain blood glucose levels, keep blood pressure and blood cholesterol levels in check, and support all the body's systems. Although these components are often isolated and sold as supplements, their effectiveness in supplement form is generally disappointing. Evidence suggests that their beneficial effects depend on complex synergies that exist among multiple protective compounds.

The balance and interaction among the essential nutrients—proteins, fats, carbohydrates, vitamins, and minerals—are critical in promoting and preserving health. These nutrients are aided by other protective compounds found in plant foods: phytochemicals, enzymes, phytosterols, and prebiotics. Although they're not considered essential, these compounds have a solid track record for promoting health and well-being and defending people against a vast array of chronic diseases.

PHYTOCHEMICALS

To enhance their own survival, all plants produce compounds called phytochemicals (*phyto* is the Greek name for "plant"). Some phytochemicals are responsible for plants' colors, flavors, textures, and fragrances and play a critical role in attracting pollinators and seed dispersers. Others act as an internal defense system that protects the plants from pests, pathogens, and potentially hostile environments. Because of individual plants' particular requirements, there may be as many as 100,000 different kinds of phytochemicals; often, thousands of copies of a hundred or more different phytochemicals can be found in a single plant.[1]

Fortunately, when plants are eaten, phytochemicals continue to work their magic in the human body. Whether serving as antioxidants, mimicking hormones, reducing inflammation, blocking tumor formation, eradicating carcinogens, stimulating enzymes, or destroying bacteria, phytochemicals have hundreds of mechanisms that help to prevent the onset of diseases and fight existing diseases.

Many factors can affect the quantity of phytochemicals in food, as well as their bioavailability. For example, agricultural factors, such as soil, water, climate, and the use of chemicals, influence phytochemical content. Organically grown produce must develop a more robust defense against assailants than plants protected by chemical pesticides, so its phytochemical content is correspondingly higher.[2–4] Conversely, storage methods after harvest can diminish phytochemical concentrations.

Food-refining methods dramatically reduce phytochemical content, especially when the most phytochemical-rich parts of plants (such as germ and bran from wheat grains) are removed, or when the processing involves exposure to harsh chemicals, heat, or pressure. Food preparation methods, such as cooking, sprouting, fermenting, blending, juicing, and processing, can have either positive or negative effects on phytochemical content and bioavailability.

Most phytochemicals are more efficiently absorbed from raw foods. For example, the absorption of isothiocyanates can be significantly higher from raw

CHAPTER 13

The Vegan Athlete

Almost two years after becoming vegan, I am stronger than ever before, and I am improving day by day . . . Go vegan and feel the power!

PATRIK BABOUMIAN, STRONGMAN

Vegan athletes are among the most persuasive ambassadors of plant-based diets. Without uttering a single word, they effectively silence naysayers by proving there's no need to eat chickens, pigs, or cows to be fast, strong, and fit.

Some athletes believe that vegan diets provide a competitive edge, particularly for endurance sports; others argue that vegan diets put athletes at a disadvantage, especially in strength-based sports. Although the evidence is limited, plant-based diets haven't been shown to be particularly better or worse than any other diet for athletic performance.[1–3]

As a result, aspiring athletes who want to join the ranks of world-class competitors, as well as recreational athletes aiming to begin entering competitions, can rest assured that a varied and well-planned vegan diet will provide all the nutrients needed to meet performance goals. In fact, a meat-free diet can fuel elite athletes, boost performance, and provide sufficient protein to sustain big gains in muscle mass. Consider just a small sampling of world-class vegan athletes (search the Internet to discover elite vegan athletes in many other sports):

- **Cam Awesome.** Amateur superheavyweight boxer; captain of the American team; winner US men's national competition and national Golden Gloves; winner of more medals than any other American amateur boxer in history.
- **Patrik Baboumian.** Strongman; European champion in powerlifting, having set three world records in the 125 to 140 kg (275 to 310 lb)

A vegan diet alone won't guarantee athletic success, but enriching the fuel mix that sustains physical activity improves efficiency. A key to achieving peak performance is consuming a healthful balance of all the necessary nutrients while meeting energy needs.

ENERGY TO BURN

Two main sources of energy feed muscles: carbohydrates (glucose and glycogen) and fats (fatty acids). These fuels are readily available in the bloodstream and are provided both by foods consumed and from body stores. Glucose is stored as glycogen in skeletal muscle and in the liver; these stores provide approximately 5 percent of the body's energy reserves. Protein accounts for only about 2 percent of the fuel burned in activities lasting less than an hour. In exercise lasting three to five hours, the contribution of protein can increase to as much as 5 to 15 percent as stores of glucose and fatty acids become depleted.[4–6] The lion's share of fuel is stored as fat.[7] Although fat stores vary dramatically from one individual to the next, they're generally sufficient to last for many hours or even days of exercise.

During the first few minutes of exercise, the body relies almost exclusively on carbohydrates for energy. As exercise continues, more fats are used. Within twenty to thirty minutes of activity, the fuel supply is about half carbohydrates and half fats. With high-intensity exercise, the balance shifts in favor of carbohydrates, and with low- or moderate-intensity exercise, fatty acids soon become the more dominant fuel sources. A benefit of aerobic training is that it increases the proportion of energy derived from fat, preserving precious glycogen stores.[8–11]

Carbohydrates continue to provide much of the fuel for higher-intensity activities because people can't metabolize fat at a high enough rate to provide all the energy needed for more-demanding activities. However, the ability to use fat as a fuel during more-intense activities improves with physical training.[11, 12] Glycogen stores are typically depleted within two to three hours of continuous moderately intense exercise, and in as little as fifteen to thirty minutes of highly intense exercise.[11] When glycogen stores are depleted, consuming carbohydrate-containing foods or beverages promotes rapid repletion of the stores. Athletes who train regularly and eat sufficient carbohydrates generally have higher resting glycogen stores than sedentary individuals.[13]

The fuel the body uses depends on the type, intensity, and duration of the activity performed, as well as fitness level. The body has two distinct pathways that unlock energy: aerobic and anaerobic.

The Aerobic Pathway (Endurance Activities)

Aerobic means "with oxygen." For the body to enter the aerobic pathway to generate energy during exercise, sufficient oxygen must be delivered to the muscles. When exercise lasts for more than two or three minutes, the aerobic mode predominates.[12] The primary fuels used during aerobic activities are fatty acids from the blood, muscles, and fat tissue and glycogen from the liver and muscle tissue.

Measuring Physical Fitness

Physical fitness is a function of strength, flexibility, and aerobic capacity. VO_2 max is the most widely used test of aerobic capacity. It's simply a test of the body's ability to use oxygen; it measures the maximum volume of oxygen an individual can use per minute of extreme exertion. It's reported as milliliters of oxygen used in one minute per kilogram of body weight (ml/kg/min). The more oxygen consumed per minute, the fitter the individual. Elite endurance athletes generally have the highest VO_2 max, with results averaging about 70 ml/kg/min, compared to inactive individuals, who average about 35 ml/kg/min.

Regular aerobic exercise can boost a person's VO_2 max by increasing the capacity of the heart and lungs to deliver oxygen to the muscles and organs. Other factors, such as genetics, age, gender, and altitude, also influence VO_2 max. Although accurate VO_2 max measures are done under strict conditions in a sports lab, they can also be estimated using treadmill, timed-run, cycling, or step-fitness tests. VO_2 max can help to assess a person's potential to perform, but it's only one of several factors that determine success. Exercise intensity is often expressed as a percentage of VO_2 max:

Low-intensity exercise: $< 30\%$ VO_2 max (example: walking)

Moderate-intensity exercise: 31–69% VO_2 max (example: jogging)

High-intensity exercise: $> 70\%$ VO_2 max (example: running)

Any exercise that uses large muscle groups over an extended period of time is an aerobic or cardio activity. Good examples include distance running, swimming, biking, cross-country skiing, rowing, hiking, and canoeing. Aerobic activities train the heart, lungs, and cardiovascular system to process and deliver oxygen more quickly and efficiently to every part of the body. As a result, a fit individual can work longer and more vigorously, and achieve a quicker recovery at the end of the aerobic exercise session.

The Anaerobic Pathway (Speed and Power Activities)

When the heart and lungs can't provide muscles with sufficient oxygen for aerobic metabolism, the muscles rely on anaerobic ("without oxygen") metabolism to generate energy. Anaerobic metabolism uses only muscle glycogen and glucose as fuels. However, this fuel-consumption process doesn't completely metabolize glucose, and fragments of lactic acid can build up, causing burning pain and muscle fatigue. When sufficient oxygen becomes available, that lactic acid can be completely broken down or converted back to glucose.

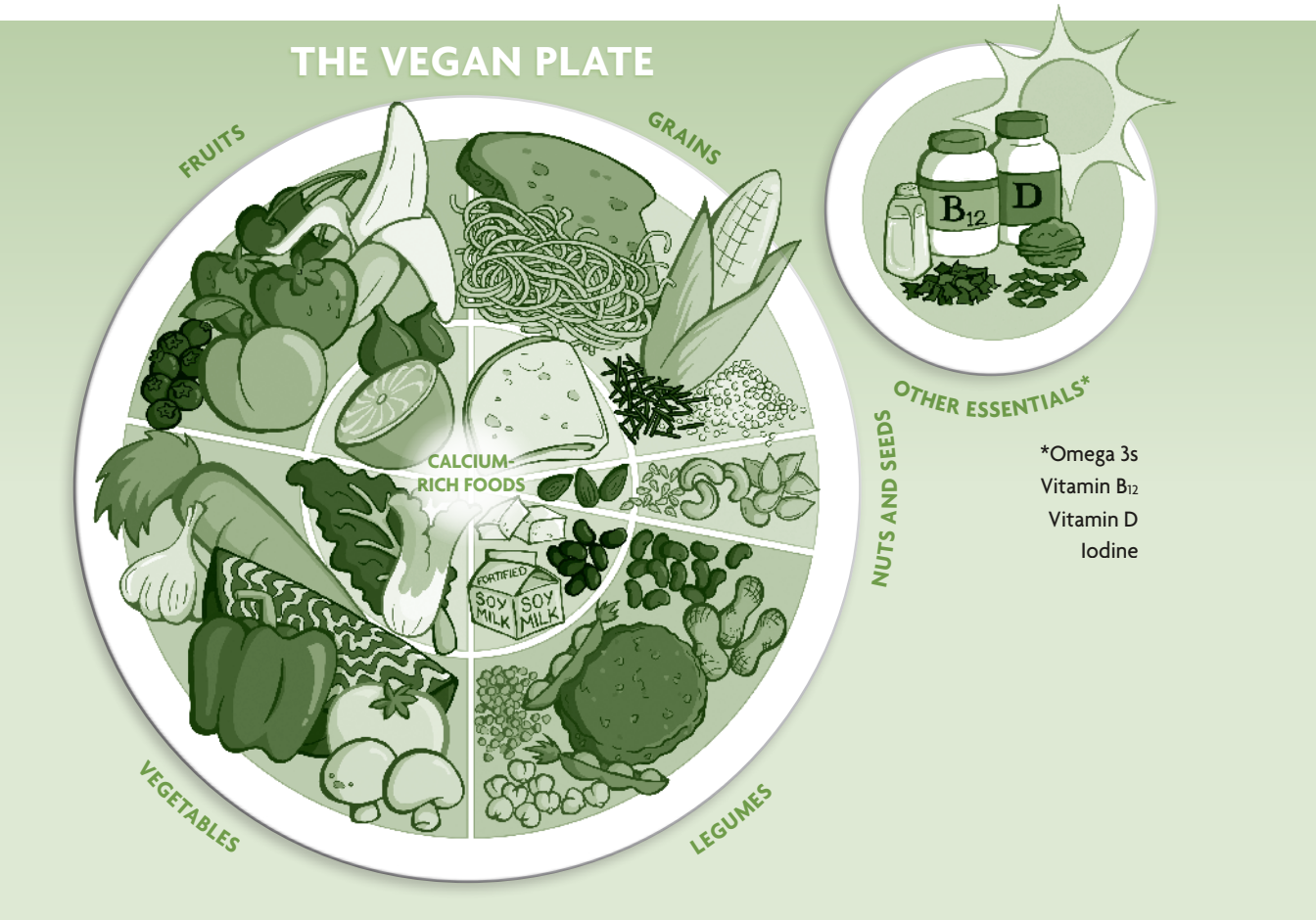
During the first two or three minutes of exercise or when the activity is so intense that energy demands outstrip the oxygen supply, the body operates in anaerobic mode. For example, during a 30-second sprint, approximately 25 to 35 percent of muscle glycogen stores are used up.[12] The anaerobic pathway predominates in speed sports, such as sprinting and other quick track events, short-distance swim races, basketball, hockey, volleyball, football, baseball,

form and on page 435 as a table. A color version is also presented on the back cover and at the becomingvegan.ca/food-guide website.

A column in the table lists the calcium-rich foods within each food group that provide about 100 to 150 mg of calcium per serving. Most plant foods provide some calcium, but the foods listed in the calcium column are especially high in this mineral. (In the graphic, calcium-rich foods are shown in the central circle.) The "other essentials" included in the illustration indicate the need for reliable sources of omega-3 fatty acids, vitamins B_{12} and D, and iodine, which may not be supplied in adequate amounts from the food groups.[12, 13]

As with any diet, it's not essential to meet the minimum intake from every food group every day, though this could be a goal for average intakes over time. In fact, eating patterns can vary greatly and still meet nutrient recommendations. As a result, The Vegan Plate is a versatile tool that can work equally well for individuals whose goal is weight loss, those whose caloric requirements have decreased with age, for athletes with high energy needs, and those in between. It can help in menu planning for couples and families, and even for people on raw vegan diets.

For those new to plant-based diets, the guide appears to recommend a lot of servings, which raises the question: Is it possible to consume that much in one day? The short answer is yes.



THE VEGAN PLATE

Daily plan for healthful eating.

FOOD GROUP (SERVINGS PER DAY)	FOODS IN THIS GROUP (SERVING SIZE)	CALCIUM-RICH FOODS: CHOOSE 6 TO 8 SERVINGS PER DAY (SERVING SIZE)	NOTES
Vegetables (5 or more servings)	½ c (125 ml) raw or cooked vegetables 1 c (250 ml) raw leafy vegetables ½ c (125 ml) vegetable juice	1 c (250 ml) cooked bok choy, collard greens, napa cabbage, kale, mustard greens, or okra 2 c (500 ml) raw bok choy, collard greens, kale, or napa cabbage ½ c (125 ml) calcium-fortified tomato or vegetable juice	Choose from the full rainbow of colorful vegetables: blue, green, orange, purple, red, yellow, and white. Include at least 2 daily servings of the calcium-rich greens.
Fruits (4 or more servings)	1 medium fruit ½ c (125 ml) fruit or fruit juice ¼ c (60 ml) dried fruit	½ c (125 ml) calcium-fortified fruit juice ½ c (125 ml) dried figs 2 oranges	Fruits are excellent sources of potassium. Select from the full spectrum of colorful fruits; feature them for dessert or treats.
Legumes (3 or more servings)	½ c (125 ml) cooked beans, peas, lentils, tofu, or tempeh 1 c (250 ml) raw peas or sprouted lentils or peas ¼ c (60 ml) peanuts 2 T (30 ml) peanut butter 1 oz (30 g) vegetarian meat substitute	1 c (250 ml) black or white beans ½ c (125 ml) fortified soy milk or soy yogurt ½ c (125 ml) calcium-set tofu (calcium should be included on the ingredient list), cooked soybeans, or soy nuts	Legumes provide generous amounts of iron, magnesium, potassium, zinc, fiber, and protein, with an average of 7 to 9 grams of protein per serving. Include a selection from this group at most meals.
Grains (3 or more servings)	½ c (125 ml) cooked cereal, rice, pasta, quinoa, or other grain or grain product 1 oz (30 g) bread ½ c (125 ml) raw corn or sprouted quinoa, buckwheat, or other grain 1 oz (30 g) ready-to-eat cereal	1 oz (30 g) calcium-fortified cereal 1 calcium-fortified tortilla	Select whole grains as often as possible. Adjust the number of grain servings to suit energy needs. Some fortified cereals and tortillas are particularly high in calcium (check labels).
Nuts and seeds (1 or more servings)	¼ c (60 ml) nuts and seeds 2 T (30 ml) nut or seed butter	¼ c (60 ml) almonds 2 T (30 ml) almond butter or sesame tahini	Seeds and nuts contribute copper, selenium, other minerals, vitamin E, and fat; choose some that are rich in omega-3 fatty acids (see page 436).

Menus

Four sample menus for people with different caloric needs follow. Additional guidance on weight management is provided in chapter 12, and nutrition for athletes is addressed in chapter 13. Plus, sample menus are suggested for:

- Pregnant or breastfeeding women (page 297), with 2,135 calories and 97 grams of protein
- Infants at the age of 7 and 11 months (tables 10.2 and 10.3 on pages 317 and 318)
- Children of different weights (table 10.6 on page 335).

Also see:

- Table 9.3 showing foods that provide 15 grams of protein per serving (page 289).
- Table 10.1 showing iron, zinc, and protein contents of foods for infants (page 312).
- Vegan food guide for 1- to 3-year-old children (table 10.1 on page 312).
- Table 10.6 showing fillings for vegan sandwiches (page 334).
- List of easy-to-prepare meals, complete with prep tips (page 356).
- Table 12.2 showing suggested daily food servings for weight gain (page 382).
- Mechanical-eating menu example for eating disorders (page 398).
- Table 12.4 showing protein-rich foods to increase the protein content of meals (page 386).
- Table 13.3 showing vegan foods that provide 10 grams of protein per serving (page 411).
- Table 13.4 showing protein-rich foods to increase the protein content of meals (page 411).
- Table 13.6 showing suggested servings from food groups at various caloric levels (page 426).

The four menus that follow are suitable for people who need 1,600; 2,000; 2,500 to 2,800; or 4,000 calories daily. A nutritional analysis follows each menu. (For recommended intakes of vitamins and minerals for various age groups, see pages 446 and 447.)

After each menu item, a letter indicates the food group it represents: grains (G); vegetables (V); fruit (F); legumes (L); nuts and seeds (N); calcium-rich foods (C); and omega-3 fatty acids (n-3). Due to the nutritional bounty of these whole plant foods, many items represent more than one food group; a summary of the total servings from each food group is shown below each menu. The nutritional analysis below each menu is based on metric measures and, where there is a choice, on the first option listed. Certain nutrients may depend on the product chosen; for example, calcium content differs markedly between brands of tofu. Any of the menus can be modified by substituting another item from that food group.

Health authorities regard well-planned vegan diets as safe and adequate for people at all stages of the life cycle, including those with unique nutritional needs, such as athletes. Furthermore, research has confirmed that vegan diets protect against many chronic diseases and are remarkably effective in treating these conditions.

Becoming Vegan: Comprehensive Edition, by internationally acclaimed vegan dietitians Brenda Davis and Vesanto Melina, presents the latest scientific findings on plant-based diets and:

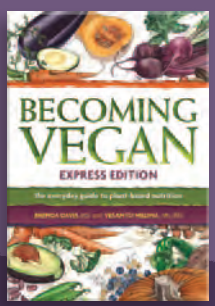
- **explores the health benefits of vegan diets compared to other dietary choices**
- **explains protein and amino acid requirements at various stages of life**
- **describes fats and essential fatty acids and their value in plant-based diets**
- **investigates carbohydrate facts and fallacies**
- **reveals the truth about wheat, gluten, and grains**
- **pinpoints where to obtain calcium, iron, zinc and other minerals without animal products**
- **clarifies the importance of obtaining adequate and reliable sources of vitamin B_{12}**
- **shows how to attain optimal nutrition during pregnancy and lactation**
- **provides nutritional guidelines for infants, children, teens, and adults, including seniors**
- **outlines how to achieve and maintain healthy weights and exceptional fitness on a vegan diet**

Completely revised, this seminal classic offers fresh insights into how a vegan diet positively affects individuals, animals, and our fragile planet. *Becoming Vegan: Comprehensive Edition* is an indispensable reference for health professionals and nutrition enthusiasts, setting the standard for vegan nutrition and providing a meticulous overview of the research.

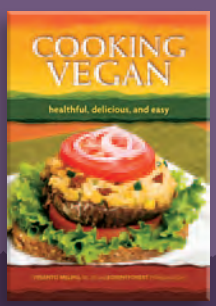
Registered dietitian BRENDA DAVIS is a leader in her field and an esteemed, popular speaker. She is a past chairperson of the Vegetarian Nutrition Dietetic Practice Group of the Academy of Nutrition and Dietetics and coauthor of more than eight books, including *Defeating Diabetes*. Brenda is the 2007 inductee into the Vegetarian Hall of Fame.

VESANTO MELINA, a registered dietitian and a sought-after speaker and consultant, has taught nutrition at the University of British Columbia and Bastyr University in Seattle. She coauthored the joint position paper on vegetarian diets for the Academy of Nutrition and Dietetics and Dietitians of Canada and is a consultant to the government of British Columbia.

FOR MORE INFORMATION, GO TO BECOMINGVEGAN.CA



For concise information on vegan diets, look for *Becoming Vegan: Express Edition*. Streamlined yet thorough and easy to understand, it provides the tools for constructing a plant-based diet that supports nutrition at any stage of life. The companion volume, *Cooking Vegan*, by Vesanto Melina and Joseph Forest contains healthy, delicious, and easy recipes and menus, all with nutritional analyses.



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