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HEALTHY EATING PATTERNS

The benefits and importance of a healthy, balanced diet are more apparent than ever to the general public. Every chef must meet the general needs of their customer base. In order for chefs to provide selections that are both delicious and healthful, they need to understand and be able to apply the techniques and concepts involved in healthy cooking.

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WHAT IS A HEALTHY EATING PATTERN?

THE ANSWER RARELY IS A SIMPLE ONE. Our individual needs differ greatly for a variety of reasons, including age, gender, activity level, and health status. As more studies are conducted and the results are analyzed, the media continue to report about miracle weight-loss diets and wonder cures that don't necessarily lead to healthy eating patterns.

At its simplest, *diet* means the foods we normally eat and drink. The definition also encompasses the notion of foods that are prescribed to an individual for a specific reason. However, diets are popularly thought of as restricting the foods someone might normally eat. Most popular weight-loss diets fall into this category. These diets are often described with an emphasis on the "delicious and bountiful" aspects of the foods the dieter is permitted to counteract the perception that diets are mainly about deprivation. Diets prescribed by a health-care professional might also include a number of restrictions, eliminating or curtailing some foods, reducing portions, or even changing someone's typical eating pattern. Some of these restrictions help control the number of calories consumed, while others are meant to prevent disagreeable, or even harmful, consequences.

A "poor" diet once meant a diet that did not supply sufficient basic nutrients to prevent an individual from starving to death or developing deficiency diseases. There are still many places in the world where these issues are of vital concern. However, in most industrialized nations the reason a diet is described as "poor" has more to do with excess: too many calories, too much sodium, or too much fat. Ironically, an excess in one area can also lead to a deficiency in another area; too many calories in the form of sugary or fatty foods may indicate a corresponding lack of fiber or vitamins.

As an individual, you may want to know about diets in order to keep yourself healthy or to lose weight. As a professional, your motivation for knowing more about a healthy diet might be to develop entire menus for clients with specific dietary needs—for instance, clients with diabetes or hypertension, schoolchildren, or the residents of an assisted-living facility. If your clientele is composed of a group that has a variety of needs or desires when it comes to eating, your challenge is developing menu items that are good options for those with a personal concern in healthier foods.

The history of medical and culinary science is littered with dietary plans, special foods, and products meant to control weight, build muscle, or treat illnesses. Graham crackers, for instance, were a health food when they first arrived on the market. Today, they are simply sweet crackers, not the cornerstone of a dietary program. Part of the issue is that today's media climate is more frenetic. There are genuine alarms about the dangers of foods that should be taken seriously, like mercury in seafood or trans fats in snack foods. However, many times the evidence for "alarming" issues is overturned almost before the ink is dry on the newspaper in which they are reported.

Today, the public is becoming increasingly aware that schoolchildren are more and more at risk for some very "adult" diseases like diabetes and hypertension. Also, baby boomers are nearly or well into their retirements and are waking up to the fact that staying healthy means learning new dietary behaviors from professionals. Chefs are not necessarily going to have all the answers about what foods are best to eat. But we believe firmly that people need to learn as much as they can about nutrition so that they can apply that knowledge in the kitchen—not as a laboratory exercise, but in the pursuit of foods and flavors that feed a hunger for satisfying, sustaining, and healthful dishes.

Chefs have a responsibility to offer foods that their patrons will want to eat that are also good for them. No one has all the answers about which foods are best, but in order to do a good job, today's chefs are honor bound to learn about the basics of food and nutrition so they can apply that knowledge as part of the techniques of healthy cooking.

In this chapter, we will examine basic nutrition concepts. If you are interested in learning more about nutrition, please review the Recommended Resources and Readings (page 515).

NUTRITION 101

WE EAT BECAUSE WE MUST. Our bodies need food in order to function properly. Human beings eat for more reasons than actual hunger, however. Very often, we eat simply because we want to eat. Our love affair with food is the basis of the culinary profession. Chefs have always been in the business of preparing and presenting foods that do much more than fill an empty belly. It is precisely because chefs have the job of enticing us to the table that they need to incorporate lessons from nutrition about food and health in the dishes they prepare.

At the same time that nearly every industrialized country is reporting a growing number of overweight and obese citizens, we are also growing increasingly aware of the relationship between the foods we eat and the consequences to our health. Nutrition is the study of how foods affect us. Simply eating "enough" is not sufficient to ensure that a diet is healthy. It is vital that we eat enough of the right foods.

The appropriate foods are those that supply us with a full array of all the nutrients we need in order to be properly nourished. In 1900, Escoffier used to talk about the "nutritive" aspects of a dish. However, at that time we were just beginning to identify the elements in foods necessary to maintain or improve our health. Because nutrition is a dynamic science, our knowledge of it changes as studies unveil new and sometimes contradictory findings. Behind the controversies and inconsistencies there remain some basic principles. We know, for instance, that getting the "right" foods generally means eating a variety of foods; no single food contains enough of all the important nutrients our bodies need. This section is a brief overview of those nutrients, as well as some basic concepts in nutrition: calories, protein, fat, carbohydrates, vitamins, and minerals.

CALORIES COUNT

FOODS PROVIDE OUR BODIES WITH ENERGY. We use this energy for physical activity as well as for basic functions like respiration, digestion, circulation, and temperature regulation. The energy used for these involuntary bodily functions is known as resting energy expenditure. Energy from food is measured in kilocalories, or the amount of energy or heat required to raise the temperature of 1 kilogram of water by 1 degree Celsius. The term *calorie* is often substituted for kilocalorie.

Calories affect body weight directly: If we consume more calories than we burn, our bodies will convert the extra calories (energy) to fat and store it throughout the body. If we burn more calories than we consume, our bodies will draw on stored energy, or fat, to perform the basic functions and to fuel physical activities.

SOURCES OF CALORIES

Calories come from four sources—carbohydrates, protein, fat, and alcohol. The majority of calories should come from carbohydrates, protein, and fat. (Alcohol does not provide any nutrients and is therefore considered nonnutritive.) The United States Department of Agriculture's Dietary Guidelines recommend ranges of 45 to 65 percent of calories from carbohydrates, and 20 to 35 percent of calories from fat, with the remaining 20 to 35 percent coming from protein. This allows for flexibility based on individual or cultural preferences, and for some health conditions.

COUNTING CALORIES

Not all sources of calories are created equal. Fat supplies more than two times the calories per gram that carbohydrates and protein do, so fats and foods that are high in fat are said to be calorie dense. But these foods may also be dense in nutrients. Alcohol also supplies significantly more calories per gram than carbohydrates and protein.

CARBOHYDRATES: 4 calories per gram

PROTEIN: 4 calories per gram

FAT: 9 calories per gram

ALCOHOL: 7 calories per gram

(*Note:* There are 28 grams in an ounce.)

FACTORS THAT INFLUENCE CALORIC NEEDS

Throughout this book, nutrition needs are discussed in the context of a 2,000-calorie day. This amount was chosen because it is the basis for the Nutrition Facts label that appears on all packaged food as mandated by federal law, and because it represents the average caloric needs for males and females between the ages of two and sixty. The actual number of calories an individual requires depends on a number of factors:

WEIGHT: In the same way that heavier vehicles use more fuel than lighter ones, heavier people require more calories than lighter individuals to maintain their weight.

ESTIMATED DAILY CALORIE NEEDS CALORIE RANGE

AGE AND GENDER	LEVEL AGE (YEARS)	PHYSICAL ACTIVITY		
		SEDENTARY	MODERATELY ACTIVE	ACTIVE
VERY YOUNG CHILDREN	2–3	1,000–1,200c	1,000–1,400c	1,000–1,400c
FEMALES	4–8	1,200–1,400	1,400–1,600	1,400–1,800
	9–13	1,400–1,600	1,600–2,000	1,800–2,200
	14–18	1,800	2,000	2,400
	31–50	1,800	2,000	2,200
	51+	1,600	1,800	2,000–2,200
MALES	4–8	1,200–1,400	1,400–1,600	1,600–2,000
	9–13	1,600–2,000	1,800–2,200	2,000–2,600
	14–18	2,000–2,400	2,400–2,800	2,800–3,200
	19–30	2,400–2,600	2,600–2,800	3,000
	31–50	2,200–2,400	2,400–2,600	2,800–3,000
	51+	2,000–2,200	2,200–2,400	2,400–2,800

U.S. Department of Agriculture Center for Nutrition Policy and Promotion

AGE AND LIFE CYCLE: People who are growing rapidly, especially infants and adolescents, as well as pregnant and nursing women, have greater caloric needs. As we age, our metabolism often slows down and we require fewer calories.

ACTIVITY LEVEL: Inactive people require fewer calories than people who move frequently. Physically demanding jobs, strenuous exercise, and even fidgeting translate into more calories expended.

GENDER: Men typically have leaner body mass or more muscle mass than women, and thus have higher basal metabolic rates than women do because muscle burns more calories than fat.

ESSENTIAL NUTRIENTS

WHEN NUTRITION SCIENTISTS use the word *essential*, they don't just mean that a nutrient is important; an essential nutrient is one that the body does not manufacture. Cholesterol, for example, performs several important functions in the body and is critical for good health. However, the human body manufactures all the cholesterol it needs, so cholesterol is not an essential nutrient.

Carbohydrates, proteins, fats, vitamins, minerals, and water are all essential nutrients. The first three are considered nutritive—that is, they supply calories. The last three are nonnutritive because they are calorie-free.

CARBOHYDRATES

Carbohydrates are the body's preferred source of energy. They fuel physical activity and basal metabolic functions and help burn fat efficiently. As carbohydrates are digested, they are broken down into sugars that the body can absorb, and use, easily. Carbohydrates provide energy for the nervous system and red blood cells, and should be 45 to 65 percent of the daily caloric intake. If carbohydrates are not consumed in sufficient quantities, the body is forced to inefficiently use protein as fuel.

CARBOHYDRATES are the main source of glucose

GLUCOSE is the body's primary energy source

GLUCOSE is the only energy source for the brain and red blood cells

EXCESS CARBOHYDRATES are stored for future energy

EXCESS CARBOHYDRATES are stored as fat

TYPES OF CARBOHYDRATES

SIMPLE CARBOHYDRATES (SUGARS)

Contain calories but few nutrients

Contain "empty" calories

Simple carbohydrates, also known as *simple sugars*, contain only one or two types of sugar molecules and are called monosaccharides or disaccharides. Easy to digest, simple carbohydrates are found in fruit, fruit juices, dairy products, and sweets.

Simple carbohydrates are often considered empty calories. Fruits contain nutrients like vitamins and fiber, and for this reason are more nutritionally dense than honey or table sugar. Sugar does not directly cause diabetes, hypoglycemia, or hyperactivity, but it can worsen an existing condition.

Carbohydrate Facts

1 gram of carbohydrate = 4 calories

Carbohydrates are found in milk, fruit, vegetables, grains, and legumes

Not all carbohydrates contain fiber (milk is an example of this)

TYPES OF SIMPLE SUGARS

Glucose

Fructose

Lactose

Maltose

Sucrose

COMPLEX CARBOHYDRATES

Are a great source of energy, vitamins, and minerals

Generally contain some fiber

Not all complex carbohydrates are whole grains

Are found in cereals, oatmeal, grains, vegetables, nuts, legumes, and breads

Complex carbohydrates contain chains of sugars and are called polysaccharides. They are more difficult to digest because they must be broken down into simple sugars first. Because complex carbohydrates take longer to digest than simple carbohydrates, they provide a sense of fullness and satiety. Whole grains, legumes, nuts, and vegetables contain complex carbohydrates. It is important to note that all carbohydrates influence blood sugar levels.

During digestion, carbohydrates are broken down into glucose, which is absorbed by the body and released into the blood. When blood sugar levels increase, the pancreas releases insulin, a hormone that makes it possible for glucose to enter the cells and be used for energy.

WHOLE GRAINS

For thousands of years, humans ate grains straight from the plant. Limited processing, if any, meant that these complex carbohydrates were rich in fiber, minerals, vitamins, and phytochemicals. Advances in grinding technology made these grains easier to chew, digest, cook, and store, but also made them less nutritionally dense.

WHOLE GRAINS

Comprise the entire grain, seed, or kernel

The kernel has three parts:

BRAN, which is the most fiber-rich portion of the kernel

GERM, which contains unsaturated fats, vitamins, and minerals

ENDOSPERM, which contains starch

During the milling process, the kernel is crushed or cracked

After processing, if the grain retains its original proportions of bran, germ, and endosperm, it can be considered a whole grain

REFINED GRAINS

A portion of the germ and or bran has been removed

Since the refining process strips away nutrients, they are added back through an enrichment process

THE GLYCEMIC INDEX

The Glycemic Index, or GI, is a tool some scientists use to measure the effects of carbohydrates on blood sugar levels. Carbohydrates in some foods are digested rapidly, and they can cause blood sugar levels to rise and then drop rapidly. The GI measures how quickly 50 grams of carbohydrates from a particular food—not 50 grams of the food itself—raise blood sugar levels compared to 50 grams of glucose. A food's GI is expressed as a percentage, with pure glucose at 100 percent.

There are a few caveats with the GI that you should keep in mind. The first is that a GI value does not address the serving sizes of foods. Consider carrots and bagels. Carrots have a GI of 71, and bagels have a GI of 72. The logical conclusion is that eating carrots will raise your blood sugar as much as eating a bagel will. But remember that the GI is based on the amount of carbohydrate in a food. One 4- to 5-ounce bagel contains about 70 grams of carbohydrates, but

1 cup of cooked carrots supplies only 13 grams. To eat 50 grams of carbohydrates from carrots, you'd have to eat about 1½ pounds of them. A serving of carrots, in fact, has a much lower impact on blood sugar levels than does a bagel.

In addition, eating foods in combination, whether that's butter or cream cheese on a bagel, or carrots in a stew or as a side dish, can affect the rate at which the sugars from these foods enter the bloodstream.

NUTRITIONAL ANALYSIS OF SELECTED GRAINS, LEGUMES, VEGETABLES, AND STARCHES

	AMOUNT*	CALORIES	PROTEIN (GRAMS)	FAT (GRAMS)	CARBOHYDRATES (GRAMS)
Amaranth, dry	1 cup	716	26.17	13.54	125.93
Barley (pearl), dry	1 cup	704	19.82	2.32	155.44
Buckwheat, dry	1 cup	583	22.5	5.78	121.5
Buckwheat flour	1 cup	402	15.14	3.72	84.7
Bulgur wheat, dry	1 cup	479	17.2	1.86	106.2
Chickpeas, cooked	1 cup	270	14	4	46
Corn	1 cup	178	5.4	2.2	41.2
Cornmeal	1 cup	441	9.9	4.38	93.8
Couscous, dry	1 cup	650	22	1.1	133.9
Kidney beans, cooked	1 cup	218	16	0	40
Lentils, dry	1 cup	678	49.5	2	115.2
Millet, dry	1 cup	756	22	8.44	145.7
Peas, cooked	1 cup	110	8	0.5	19
Quinoa, dry	1 cup	626	24	10.3	109.01
Rice (brown), dry	1 cup	885	14.68	5.4	142
Rice (white), dry	1 cup	675	13	1.22	147
Rolled oats, dry	1 cup	160	6	3	28
Spelt, dry	1 cup	588	25.35	4.2	122.13
Teff, dry	1 cup	708	25.6	4.59	141.14
Triticale, dry	1 cup	645	25	4	138.48
Whole wheat flour	*1 cup*	*408*	*15.8*	*3*	*86.36*
Wheat germ	*1 cup*	*414*	*26.62*	*11.17*	*59.6*
Wild rice, dry	*1 cup*	*357*	*23.56*	*1.72*	*119.8*

*All figures based on grains and legumes cooked in water.

Similar foods may have very different GIs. An oatmeal cookie may have a much lower GI than a chocolate chip cookie. That's because whole grains like oatmeal are digested more slowly than refined grains like all-purpose flour, in part because fiber can slow the rate at which sugar is absorbed by the bloodstream.

Determining GI is a labor-intensive process. To measure a food's effect on blood sugar, a person first must eat the food, and then blood must be drawn and analyzed. Blood sugar levels must be noted before and after the food is consumed, and because individuals respond differently to foods, these tests must be conducted on several people before a GI can

Blood Sugar, Insulin, and Diabetes: What's the Connection?

DURING DIGESTION, carbohydrates are broken down into glucose, which goes into the bloodstream to become blood sugar. In a healthy person, insulin—a hormone produced by the pancreas—regulates blood sugar levels and helps carry blood sugar into cells for energy.

In a person with diabetes, insulin either is produced in insufficient amounts or does not perform its functions. Rather than passing from the blood into the body's cells, glucose builds up in the bloodstream. Excess blood sugar goes into the kidneys to be excreted, causing more work for the kidneys. Over time, high blood sugar levels can cause damage to the kidneys, eyes, circulatory system, and nervous system.

Type I diabetes is an autoimmune disease (like lupus or rheumatoid arthritis) that occurs when the cells in the pancreas responsible for producing insulin have been destroyed by the body's immune system. It accounts for only 5 to 10 percent of all diabetes cases. Type II diabetes occurs when the body stops producing as much insulin or becomes resistant to it; it is most often diagnosed in people who are overweight, physically inactive, and older. There is increasing concern among the healthcare and public health community about the increasing rates of Type II diabetes among children in the U.S. It is estimated that 1 out of every 3 American children born after the year 2000 will develop Type II diabetes unless rates of childhood obesity start to decrease.

There is no cure for diabetes, but it can be managed. Type I diabetes requires daily insulin, as well as a careful management of diet and physical activity and stress. Type II diabetes can often be controlled through diet, physical activity, and weight management alone, but sometimes oral medication or insulin is necessary.

For information about dietary recommendations for people with diabetes, see page 29.

Is Juice Bad for You?

THERE'S CURRENTLY A DEBATE RAGING over juice. One side says it's a healthful beverage—much better for you than sugary sodas. The other side says it can contribute to weight gain and tooth decay every bit as much as soda does.

The truth is that both sides are right. Compared to sodas, "elixirs," and sport drinks, juices are a fairly nutritious choice. While all contain sugars in comparable amounts, no-sugar-added juices get their sweetness from naturally occurring fruit sugar called fructose, whereas most sugar-sweetened drinks get their sweetness from high-fructose corn syrup. Both types of sugar are metabolized in the same way. Juice, however, does supply some vitamins and minerals, as well as antioxidants and phytochemicals, which are found in the fruits from which they are made.

But if you compare an 8-ounce glass of fruit juice to the medium-size fruit from which it's made, it doesn't look so nutritious:

FOOD	CALORIES	CARBOHYDRATES (GRAMS)	SUGAR (GRAMS)	FIBER (GRAMS)
Orange juice	120	28	22	0.5
Orange	60	15	12	3
Apple juice	120	28	24	0.2
Apple (w/skin)	100	25	19	4

Bottom line: Juice contains nutrients that other beverages don't, but it lacks the fiber that fruit contains.

be determined. At present, only a limited number of foods have been tested.

To review the GI of various foods, visit www.glycemicindex.com.

FIBER

Fiber is a form of carbohydrate that is indigestible and nonnutritive. It is a mixture of several compounds, and the proportion of these compounds in a food varies. Fiber is divided into two basic types: soluble and insoluble.

Soluble fiber dissolves in water. Pectins and gums are components of soluble fiber. Soluble fiber regulates the body's use of sugars by slowing their digestion and release into the bloodstream. Soluble fiber binds with cholesterol-rich bile acids in the intestine, which may help to reduce serum cholesterol levels. Beans, fruits, oats, and barley are good sources of soluble fiber.

Insoluble fiber does not dissolve in water. Instead, it absorbs water and provides bulk in the diet. Cellulose, hemicellulose, and lignin are components of insoluble fiber. Insoluble fiber helps clear out the intestinal tract and may reduce the risk of certain types of cancer and the risk of Type II diabetes. Fruits and vegetables, wheat bran, whole-grain flours, and popcorn are good sources of insoluble fiber.

THE HEALTH EFFECTS OF FIBER

HEALTH EFFECT	INSOLUBLE FIBER (CELLULOSE, LIGNIN, HEMICELLULOSE)	SOLUBLE FIBER (PECTIN, GUMS)
Decreases colon cancer risk	No	No
Lowers blood cholesterol	No	Yes
Lessens constipation and hemorrhoids (reduces pressure, softens stools)	Yes	No
Speeds up transit time in the colon (helps body eliminate waste)	Yes	No
Interferes with mineral absorption	Yes	No
Interferes with vitamin A	Not known	Yes, pectin does
Provides feeling of fullness	Yes	Yes

PROTEIN

Protein is essential for growth. We use it to build, maintain, and repair tissues; to produce hormones, enzymes, and antibodies; to transport nutrients and oxygen throughout the body; and to regulate the balance of bodily fluids. If insufficient carbohydrates are available, protein can also be used for energy. However, carbohydrates cannot perform all of the functions that protein does.

Proteins are made of amino acids. All of the proteins found in human cells are composed of about twenty amino acids. Essential amino acids are those that humans cannot produce on their own. Adult humans must acquire eight amino acids from their diets. From those acids, their bodies can produce the remaining twelve that are necessary to produce the proteins they need. Conditionally, essential amino acids are those that our bodies are not currently producing for one of the following reasons: age (for instance, infants and children require histidine and arginine), stress, injury, disease, or physical exertion. Under those conditions, some other amino acids need to be introduced through appropriate dietary sources or supplements.

ESSENTIAL AMINO ACIDS

The basic building blocks of protein are known as amino acids. The multitude of proteins found in a human cell are composed of about twenty amino acids, most of which are produced by the body.

The eight essential amino acids are:

1. Isoleucine
2. Lysine
3. Phenylalanine
4. Trytophan
5. Leucine
6. Methionine
7. Threonine
8. Valine

Normally the body can acquire these eight amino acids. However, when insufficient amounts of the eight essential amino acids are consumed, a dietary source for conditionally essential acids may become necessary.

THE AMINO ACIDS

ESSENTIAL	CONDITIONALLY ESSENTIAL*	NONESSENTIAL
Isoleucine	Arginine*	Alanine
Leucine	Cysteine	Aspartic acid
Lysine	Histidine	Cystine
Methionine	Tyrosine**	Glutamic acid
Phenylalanine		Glutamine
Threonine		Glycine
Tryptophan		Proline
Valine		Serine

*Essential for infants and small children.

**Tyrosine is made from phenylalanine, so if there is a deficiency of phenylalanine, tryosine may be required.

PROTEINS IN THE DIET

Foods that provide protein are divided into two groups—complete and incomplete proteins. Complete proteins are those foods that provide all of the essential amino acids in sufficient quantity to support growth and maintenance of body tissues. Foods that contain complete proteins provide a higher quality of protein; examples are meat, fish, poultry, cheese, eggs, milk, and isolated soy protein. In short, animal and soy products contain complete proteins.

Incomplete proteins lack one or more of the essential amino acids in sufficient quantity to support growth and maintenance of body tissues. Foods that contain incomplete protein provide a lower quality of protein. With the exception of soy foods, quinoa, and amaranth, all other plant foods (grains, vegetables, nuts, seeds, and legumes) are considered incomplete proteins. In short, most plant products contain incomplete proteins.

While most people choose to include some animal protein in their diets, it is important to note that all of the essential amino acids can be obtained by consuming a variety of vegetable foods, each with a different quality and quantity of amino acids. Plant sources of protein can meet nutritional needs for protein if a sufficient variety of foods such as grains, cereals, nuts, seeds, and legumes are incorporated in the diet.

Making incomplete proteins complete is as simple as eating a peanut butter and jelly sandwich or baked beans and brown bread. Bread is rich in the amino acid methionine, but low in lysine. Legumes (peanuts and beans) are rich in lysine, but low in methionine. When both are combined, they "complement" each other and a complete protein is formed. Civilizations throughout history have combined foods to make complete proteins. Some examples include rice and beans (Mexican), tofu and rice (Asian), pasta and beans (Italian), corn and lima beans (American Indian), and hummus and pita bread (Middle East). It is interesting to theorize whether this "natural" combining of foods to make complete proteins was by accident, belief, or a factor of cultural survival.

COMPLETE PROTEINS	INCOMPLETE PROTEINS
Meats	Vegetables
Poultry	Dried and cooked legumes
Fish	Nuts
Amaranth and quinoa	
Soy	
Animal products	

MAKING COMPLETE PROTEINS

CEREALS, GRAINS, AND DAIRY	LEGUMES	EXAMPLES
VEGAN		
Cornmeal	Dried beans	Bean taco
Barley	Dried peas	Barley and pea risotto
Whole-grain breads	Peanuts	Peanut butter sandwich
Rice	Soy products	Tofu with rice
Pasta	Dried beans	Pasta e fagioli
LACTO-OVO VEGETARIAN		
Eggs	Whole grains	French toast
Cheese	Vegetables	Eggplant Parmesan

ESSENTIAL PHYTOCHEMICALS

Phytochemicals and antioxidants are the new frontier in nutritional research. They are good news for people concerned with healthy eating because, after years of hearing about foods that are bad for us and should be avoided, we now have a nutritional champion to focus on.

Phytochemicals, like vitamins, are compounds that occur naturally in fruits, vegetables, legumes, and grains. Unlike vitamins, phytochemicals have not yet been recognized as essential to life, and clear deficiency levels have not been identified. As more is discovered about phytochemicals, deficiency levels may eventually be established for some of these compounds. Although phytochemicals are a relativity new subject for scientific study, research results so far indicate that they may help reduce the risk of certain cancers, heart disease, and some other chronic diseases. For more information about phytochemicals, see page 26.

FAT

Fat has been maligned for decades, but it is an essential nutrient that performs several vital functions within the body. It surrounds and cushions vital organs, helps to maintain body temperature, maintains structural elements in cells, helps the immune system to function properly, slows digestion, makes the fat-soluble vitamins (A, D, E, and K) available to the body, and supplies essential fatty acids necessary for normal growth and development. However, too much of the wrong types of fat can increase the risk of coronary heart disease, obesity, and certain types of cancer.

Though it makes sense to conclude that eating fat will cause you to become fat, this isn't necessarily true. Excess calories, whether from fat, carbohydrates, protein, or alcohol, combined with too little activity, are what cause weight gain and obesity. However, fat is calorie-dense, so it is easier to consume too many calories from fat than from protein or carbohydrates. In addition, fat is more readily stored as adipose (body) fat than carbohydrates and protein.

Fats are comprised of linked chains known as *fatty acids.* Each fatty acid is composed of carbon, hydrogen, and oxygen. The number of slots for hydrogen atoms to bond with carbon atoms determines whether a fat is considered saturated, monounsaturated, or polyunsaturated. If there is no room for any more hydrogen, the fatty acid is considered saturated. Monounsaturated fats have room for two hydrogen atoms on the chain, and polyunsaturated fats have more than two "slots" open.

Monounsaturated fats appear to raise levels of high-density lipoprotein (HDL) in the blood. Sometimes called "good cholesterol," HDL is associated with reduced health risks for circulatory diseases. Olive oil, canola oil, and some nut oils are monounsaturated. Brazil nuts, cashews, avocados, and pumpkin seeds are high in monounsaturated fats.

Polyunsaturated fats, like monounsaturated fats, are associated with reduced health risks and are liquid at room temperature. Cooking oils made from corn, safflower, sunflower, and soybeans are polyunsaturated. Omega-3 and omega-6 fatty acids are polyunsaturated (see table on page 15).

Saturated fats can cause elevated levels of low-density lipoprotein (LDL) in the blood. (They also may cause high-density lipoprotein, or HDL, levels to rise, which can balance the high LDL to a certain extent.) Usually solid at room temperature, saturated fats include butter, lard, and other animal-based fats, as well as tropical oils such as coconut, palm, and palm kernel.

Coconut oil and palm oil are higher in saturated fat than other plant oils. They are less harmful than partially hydrogenated oil, which is high in trans fats. But they are less beneficial to the heart than plant oils that are rich in unsaturated fats like extra-virgin olive oil, canola oil, and sunflower oil. Coconut oil increases good HDL cholesterol levels, which may make it a good choice when cooking a dish that needs a little hard fat.

Trans fats are usually solid at room temperature, and they can cause levels of LDL to increase—but unlike saturated fats, trans fats cause levels of HDL to decrease as well. They may also be carcinogenic. Trans fats are formed when liquid oils are processed into solids like shortening or margarine.

HIGHLIGHTS OF PHYTOCHEMICALS IN PLANTS

PLANT FOOD	PHYTOCHEMICAL	PROTECTIVE EFFECTS: SUMMARY POINTS
Grains and beans Soybeans	Saponins Isoflavones Genistein	Neutralize cancer-causing enzymes in the gut Reduce serum cholesterol and plaque formation Alter hormone metabolism
Allium vegetables: garlic, onions, chives, leeks, scallions	Sulfur allyl cysteine Allicin	Help the liver detoxify cancer-causing chemicals Cholesterol reduction
Cruciferous vegetables: broccoli, kale, Brussels sprouts, cabbage, cauliflower	Sulforane Brassinin Indoles Glucosinolates Indoles Isothiocyanate	Antioxidant properties
Citrus fruits	Terpenes (limonene)	Boost the protective enzyme activity
Wines, grapes, cranberries	Flavonoids Ellagic acid	Combat oxidation and blood clots Antioxidant properties prevent DNA damage
Tea	Polyphenols, catechins Flavonoids	Antioxidant properties prevent DNA damage Prevent cancer cell growth Reduce serum cholesterol
Tomatoes	P-coumaric acid Lycopene	Bind with nitrites before they form cancer-causing nitrosamines Antioxidants protect against colon and bladder cancer
Fiber	Phytoestrogens	Reduce risk of hormone-related cancers

Additional hydrogen atoms bond alongside the carbon atoms. This increases the smoke point of the fat and improves its shelf life, making trans fats a popular choice for commercial baked goods and frying.

It is important to remember that all foods and beverages that contain fat usually contain a combination of saturated, monounsaturated, and polyunsaturated fat. When a food, like olive oil, is referred to as a monounsaturated fat, that means that the majority of the fat in that product is monounsaturated. Olive oil also contains smaller amounts of saturated and polyunsaturated fats.

ESSENTIAL FATTY ACIDS

There are twenty fatty acids in the human body, and they are made from two: linoleic acid, also known as *omega-6 fatty acid,* and linolenic acid, also called *omega-3 fatty acid.* In addition to the functions at right, these fatty acids are crucial in producing prostaglandins, hormone-like substances that control pain and inflammation, allergic reactions, and blood clotting; help to regulate blood pressure; and are used in making hormones.

Why Is It Time to End the Low-Fat Myth?

DOZENS OF STUDIES HAVE FOUND that low-fat diets are no better for one's health than moderate or high-fat diets—and for many people, they may be worse. Low-fat diets are usually high in carbohydrates, which often come from rapidly digested foods such as white flour, white rice, potatoes, sugary drinks, and snacks containing refined starches and sugars. Eating lots of these "fast carbs" can cause quick, sharp spikes in blood sugar and insulin levels, and over time can increase the risk of diabetes and heart disease. High-carbohydrate, low-fat diets also have a negative effect on the fats and cholesterol in our blood: They raise the "bad" blood fats (triglycerides) and they lower the "good" blood cholesterol (HDL), both of which can increase the risk of heart disease. These diets also tend to increase blood pressure. Note that if you've been able to keep your weight, blood cholesterol fractions, and blood glucose under control while eating a low-fat diet, this type of diet may be working for you. But for many people, low-fat diets don't work.

For many folks, low-fat diets are simply not the best choice for health. Carefully conducted clinical trials found that following a low-fat diet doesn't make it any easier to lose weight or keep it off. A high intake of carbohydrates, particularly if they come from refined rather than whole grains, can make weight control more difficult. In fact, study volunteers who follow moderate or high-fat diets lose just as much weight—and in some studies a bit more—as those who follow low-fat diets. Calories are what count for weight loss, so it's important for people to find a lower-calorie eating plan that can be followed for lifelong health.

It's a myth that eating high-fat foods makes people fat. Eating more calories than one needs from *any* source, whether fat, carbohydrate, or protein, can lead to weight gain. Over the past 30 years in the U.S., the percentage of calories consumed from fat has actually *gone down*, but obesity rates have skyrocketed. Sugary

ESSENTIAL FATTY ACID	FUNCTION	SOURCE
Omega-3	Reduces risk of heart attack by lowering the amount of cholesterol manufactured by the liver. Helps prevent blood clots from forming in deposits of arterial plaque. May slow or prevent growth of tumors, stimulate the immune system, and lower blood pressure.	Fatty fish including mackerel, salmon, trout, anchovies, albacore tuna, and sardines; walnuts; canola, soy, and flaxseed oils
Omega-6	Reduces the risk of cardiovascular disease by lowering total and LDL cholesterol. May also reduce HDL cholesterol levels.	All polyunsaturated foods; corn, soy, and safflower oils

soft drinks don't contain any fat—yet the billions of gallons that Americans drink each year have been a major contributor to the obesity epidemic.

Some types of fats are, however, more healthful than others:

UNSATURATED FAT is the healthiest type of fat. Plant oils (such as olive, canola, soybean, peanut and other nut oils), nuts (such as almonds, peanuts, walnuts, and pistachios), avocados, and fish (especially oily fish such as salmon) are excellent sources of unsaturated fat. Eating unsaturated fat in place of refined grains and sugar can improve blood cholesterol profiles and lower triglycerides, and in turn, lower the risk of heart disease. It's essential to include a special kind of unsaturated fat, called omega-3 fat, in the diet; good sources include fish, walnuts, canola oil, and soybean oil.

SATURATED FAT is less healthy, since it raises "bad" (LDL) cholesterol in the blood. It would be difficult to completely eliminate saturated fat from our cooking, though, because foods that are rich in healthy fats also contain a little bit of saturated fat. The best strategy is to limit foods that are *very* high in saturated fat, such as butter, cheese, and red meat, and replace them with foods that are high in healthy fats, such as plant oils, nuts, and fish. An alternative approach is to just use a very small amount of full-fat cheese, butter, cream, or red meat in dishes that emphasize plant foods such as vegetables, whole grains, and legumes.

TRANS FATS from partially hydrogenated oils are especially bad for health. Eating just a small amount of trans fats on a regular basis raises the risk of heart disease. So it's best to avoid trans fats altogether.

Keep in mind that most foods contain a mix of fats. The key to a healthy diet is to choose foods that are higher in unsaturated fat than saturated fat—and that do not contain any trans fats.

Finding Foods with Healthy Fats

SOME FOODS ARE RICH IN HEALTHY FATS—and some foods aren't. The healthiest: seafood, nuts, and oils, since they have omega-3s and other unsaturated fats. The harmful: red meat, butter, and ice cream, since they have too much saturated fat. The worst: partially hydrogenated oil, also known as trans fat. So choose foods rich in healthy fats. Limit foods high in saturated fat. And avoid foods with trans fat.

Salmon, tuna, fatty fish	<BEST	Seafood omega-3 fats
Walnuts, canola oil, flax seeds		Plant omega-3 fats
Corn, soy, and safflower oils		Plant omega-6 fats
Olive* and peanut oils, nuts, avocados		Monounsaturated fats
Red meat, butter, cheese, ice cream	WORST>	Saturated fats
Partially hydrogenated oil		Industrial trans fats

*Extra-virgin olive oil is rich in antioxidants and likely has additional health benefits.

**Coconut and palm oils are high in saturated fat, but may not have the same harmful health effects as saturated fat from meat and dairy products.

Adapted from D. Mozalfarian

CHOLESTEROL

Cholesterol is not a fat; it has no calories. It is a fat-related compound in the lipid family. Although cholesterol is essential to good health, it is not an essential nutrient because our bodies produce all of the cholesterol we need. Cholesterol can be measured in two ways: in our blood (serum cholesterol) and in our foods (dietary cholesterol). Dietary cholesterol is found in animal foods. (Cholesterol does not exist in plant foods.)

The average adult in the U.S. consumes about 270 milligrams of dietary cholesterol every day. The human liver manufactures 1,000 to 1,500 milligrams of cholesterol every day from dietary saturated fat. The best way to reduce serum cholesterol is to limit the intake of saturated fat so that the liver can't produce as much. Cholesterol is important in our bodies; it protects nerves, produces vitamin D on the skin when exposed to sunlight, and is an important building block in the manufacture of hormones.

Cholesterol is transported throughout the body by lipoproteins in the bloodstream. Low-density lipoproteins (LDL) carry cholesterol from the liver to the body's cells, but they are not very efficient and also tend to "drop" cholesterol. These deposits, called *plaque*, may build up on the walls of arteries and blood vessels and eventually block them, obstructing the flow of blood. This can cause a condition called *atherosclerosis*, which can lead to coronary and cerebral thrombosis and embolisms. Plaque buildup happens gradually. It isn't until arteries are about 75 percent blocked that symptoms like chest pain or shortness of breath occur.

High-density lipoproteins (HDL) transport cholesterol from the body's cells back to the liver, where

it is broken down and flushed out of the body or reassembled into other compounds.

HDLs also "sweep up" the cholesterol in the bloodstream that LDLs have dropped, so high levels of HDL indicate a reduced health risk, whereas very low levels can leave cholesterol in the blood rather than ferrying it to the liver for removal.

Eating a diet high in cholesterol does not always translate into high levels of serum cholesterol. For most people, diets high in saturated fats and trans fats have a more direct impact on serum cholesterol levels. However, dietary cholesterol is found in animal products, which tend to be higher in saturated fats than plant foods. For this reason, it is recommended that the daily intake of dietary cholesterol not exceed 300 milligrams.

Studies show that people who eat more polyunsaturated fat than saturated fat have lower serum cholesterol levels and lower incidences of heart disease. When most of the fats consumed are unsaturated, there appears to be a positive effect on HDL levels. Polyunsaturated fats have also been linked to lower serum cholesterol levels, but in large amounts they may also lower HDL, which can be detrimental. The bottom line: Focus on eliminating trans fats, reducing saturated fats, and consuming unsaturated fats from plant sources.

ESSENTIAL NONCALORIC NUTRIENTS

There are some components of food that are essential to good nutrition but that do not supply calories: water, vitamins, and minerals.

WATER

The adult human body is nearly 60 percent water. Water contains no calories and is not a significant source of nutrients, but without it humans can survive for only a few days. Water can be found in every cell in the human body and is critical to the body's chemical reactions.

WATER ALSO

DISSOLVES water-soluble vitamins, minerals, and other compounds to transport them to each cell via the bloodstream

REMOVES impurities from the bloodstream and the body

CUSHIONS joints, organs, and sensitive tissues such as the spinal cord

MAINTAINS pressure on the eyes' optic nerves for proper vision

STABILIZES blood pressure

REGULATES body temperature

We typically lose 2 to 3 quarts of water, or anywhere from 8 to 12 cups of water, each day as our bodies use it to cleanse and cool the body while it carries out different processes. Our need for fluids increases in hot or humid weather and during strenuous exercise. We must replenish the water we lose every day because the body does not store excess water.

Most recommendations suggest a minimum of eight glasses of water per day. It is possible to consider some of the foods we eat as a surprisingly good source of water. Some foods supply little to no water—vegetable oil is 100 percent fat and supplies no water, and other dense foods like nuts, honey, raisins, and Cheddar cheese are less than one-third water. Would you guess, though, that roast beef and chicken are two-thirds water? They are. And fruits and vegetables are all extremely good sources of water as well. Broccoli and carrots, for example, are comparable in water content to milk.

Fluids other than water can also contribute to the daily requirement. Milk and juice are adequate sources, and it appears that caffeinated beverages may be as well. People were told that caffeinated drinks didn't count because they were thought to cause a diuretic effect and could actually increase your body's need for additional water. A small study of eighteen adults demonstrated that there was no statistical difference in hydration levels when water or caffeinated beverages were consumed. Because

The Balancing Act

MANY EXPERTS RECOMMEND LIMITING FATS to about 35 percent of calories, but what often gets lost in communication is that this percentage is over the course of a day, and could even be averaged over a few days. It does not mean that only foods with 35 percent or less of the calories from fat should be eaten.

For example, salmon can vary considerably in fat content depending on where and when it is caught, but it typically gets at least 40 percent of its calories from fat—above the 35 percent limit. Top the salmon with a fruit salsa and serve it with a whole-grain pilaf and some sautéed vegetables, and the calories from fat can drop to 25 or 30 percent for the meal. Salmon is also full of healthier fats, which is extremely important to consider when looking at fat consumption. The type of fat used in cooking is much more important than that amount of fat that is used.

this study was preliminary, it makes sense to moderate consumption of caffeinated and alcoholic beverages, since both are diuretics.

Our bodies also produce water through metabolic functions—about a cup a day. For most individuals, drinking eight glasses of water can be a challenge. A more reasonable, but still appropriate, goal of five or six cups of liquid in the form of water or other nonalcoholic beverages takes into account the three to four cups of water that foods with a high water content provide.

VITAMINS AND MINERALS

Like water, vitamins and minerals do not supply calories. Although they are important to overall health, they are generally required in smaller quantities than energy-providing nutrients. Recommended Daily Values (DVs) have been established for many of the vitamins and minerals known to be important to good health. These are listed in the Appendix.

Daily Values are the amounts listed on Nutrition Facts labels of packaged food, and they are based on the standard 2,000-calorie diet. They are not necessarily the amount a person needs to prevent disease or to enjoy or maintain health. The Dietary Reference Intake (DRI) for a food is based on age and gender and gives the amount each subgroup requires.

The DV for calcium, for example, is 1,000 milligrams. If a Nutrition Facts label says that 1 cup of yogurt supplies 35 percent of the DV for calcium, that food contains 350 milligrams calcium. Not everyone needs only 1,000 milligrams of this mineral, though. Adolescents and young adults should get at least 1,300 milligrams, and people over fifty need at least 1,200. For them, that cup of yogurt supplies only 27 percent or 29 percent of the DV of calcium.

WATER-SOLUBLE VITAMINS

Water-soluble vitamins dissolve in water and are easily transported throughout the body in the bloodstream. These vitamins include the B-complex vitamins (thiamin, riboflavin, niacin, folacin, biotin, pantothenic acid, B_6, and B_{12}) and vitamin C. B-complex vitamins are found in grains, legumes, vegetables, meats, and fortified cereals. They perform many functions: Thiamin, riboflavin, niacin, and B_6 are used in metabolizing nutrients. B_{12}, which is found only in animal foods, is used to synthesize amino acids and in the formation of blood. Folacin, also called

folate (when it occurs naturally in foods) and *folic acid* (when it is synthetic), are used in blood formation and amino acid metabolism.

Deficiencies of the B-complex vitamins can range from reduced stamina and insomnia to nervous system damage, liver damage, ulcers, and death. Insufficient folacin is the most common vitamin deficiency and has been linked to birth defects such as spina bifida.

Vitamin C is found in fruits and vegetables. Although oranges are practically synonymous with vitamin C, they are not the richest source: guava, strawberries, broccoli, and red bell peppers supply more per serving. Vitamin C performs hundreds of functions in the body: It increases the body's absorption of iron and is imperative to the growth and maintenance of body tissues. Vitamin C is used to produce collagen, a protein substance that helps hold tissues together, like muscles to bone or teeth to gums. Vitamin C also boosts the immune system and has antioxidant properties that protect cells from damage caused by oxygen. It may also protect against heart disease and cancer.

A small amount of water-soluble vitamins can be stored briefly in lean tissue, such as muscles and organs, but the body's supplies must be replenished daily. Toxic levels of these vitamins are possible but unlikely because any excess is excreted from the body.

Water-soluble vitamins can be affected by ordinary food-handling techniques and cooking methods. B vitamins are somewhat more stable than vitamin C, but both can be lost through the following:

EXPOSURE TO AIR (removing peels, cutting foods, or storing food uncovered)

HEAT (cooking or storing at room temperature)

EXPOSURE TO WATER (rinsing cut foods before they are cooked, cooking foods in water, holding foods in water)

TIME (as foods age, they lose moisture and, along with the moisture, vitamins)

TO RETAIN WATER-SOLUBLE VITAMINS, OBSERVE THE FOLLOWING RECOMMENDATIONS:

Keep cooking times to a minimum

Cook foods in as little water as possible, or choose a dry-heat technique like roasting

Prepare foods as close to their time of service as possible

Purchase foods in reasonable amounts to avoid prolonged storage

FAT-SOLUBLE VITAMINS

Vitamins A, D, E, and K are fat-soluble—they are stored in fat tissues and, once ingested, cannot be easily flushed from the body. In the proper amounts, fat-soluble vitamins are basic to health, but exceeding the DVs for these vitamins can cause them to build up in the body, making it easy for toxic levels to accumulate. Once toxic levels are reached, a variety of dangerous and even fatal conditions may develop. These vary by vitamin, but kidney stones, nerve damage, and abnormal bone growth are just a few.

Fat-soluble vitamins are far more stable than water-soluble ones. They cannot be destroyed by contact with air or water, and are less affected by heat than are water-soluble vitamins.

Some fat-soluble vitamins increase in bioavailablity when they are heated. Carotenoids such as lycopene in tomatoes and beta-carotene in carrots are more available to the body after cooking. Cooking breaks down cellular walls, and it concentrates these nutrients.

UNITS OF MEASURE FOR DAILY VALUES OF VITAMINS AND MINERALS

Gram (g)	The equivalent of 1/28 of an ounce. Few vitamins and minerals are measured in grams.
Milligram (mg)	One-thousandth of a gram. The majority of vitamins and minerals are measured in milligrams.
Microgram (µg)	One-millionth of a gram. Folacin, vitamin B_{12}, and vitamin A are measured in micrograms.

Evaluating Studies

DEPENDING ON YOUR SOURCE OF INFORMATION, you may have heard that fiber is good for you or that it has no effect on your health. You may have heard that low-fat diets are the key to reducing cancer and heart disease or that the amount of fat you eat doesn't matter. And you have read in this chapter that caffeinated beverages might or might not affect dehydration. Studies on human nutrition are done in many different ways, and the strength of the data depends on whether or not it can be replicated by other researchers in other populations. Epidemiological studies track people over time. They can show relationships between diet and lifestyle factors and health outcomes, but they cannot provide "cause and effect" relationships. Case-control studies compare the diet and lifestyle choices of people with a disease compared to people with similar characteristics (e.g., age, gender, where they live, where they work) who never developed the disease. The problem with these types of studies is that they often rely on people's memories to report what they ate and how much they exercised. The "gold standard" studies are called randomized controlled trials (RCTs), but they are very expensive to run and people who tend to volunteer for these types of studies are not "average" Americans. They tend to be more educated with higher incomes.

One other thing to keep in mind is that nutrition is an evolving science. There are some issues on which experts agree (e.g., whole grains are good for us), but there are other issues for which more research is needed (e.g., whether wild salmon is better than farmed salmon for human health) before consensus is reached. So as you read about nutrition research and you see recommendations or claims that may seem contradictory, remember that the science is constantly evolving and that each year, consensus is reached on more and more issues.

TIPS FOR EVALUATING NUTRITION AND HEALTH RESEARCH STUDIES AND ARTICLES

The credibility of nutrition and health information in print and online sources varies widely depending on the level of effort the writer put into summarizing the research findings on a single study or subject. Writers who simply review abstracts of studies, typically 200-word summaries of the research study, may miss important facts that are only included in the peer-reviewed, full version of the article. Many writers may not even review the original research article, and instead simply re-report what others reported in their consumer articles.

It is therefore important to ask yourself the following ten questions, based on "The 10 Red Flags of Junk Science," originally published by The Food and Nutrition Science Alliance (FANSA) in the 1990s. FANSA is a partnership of the Academy of Nutrition and Dietetics (formerly the American Dietetic Association), the American Society for Clinical Nutrition, the American Society for Nutritional Sciences, and the Institute of Food Technologists.

DOES THIS ARTICLE PROVIDE RECOMMENDATIONS THAT PROMISE A QUICK FIX? If so, be leery. Claims of miracle cures or rapid weight loss should not be viewed as credible.

DOES THIS ARTICLE MAKE DIRE WARNINGS OF DANGER FROM A SINGLE PRODUCT OR REGIMEN? Recommendations to eliminate certain foods or food groups should be viewed with suspicion. Unless a person has a food allergy or other medical condition that warrants eliminating a food or ingredient, there is no need to eliminate foods or food groups. Dietary patterns over time predict

future health outcomes, not the consumption or avoidance of single foods.

DOES THIS ARTICLE MAKE CLAIMS THAT SOUND TOO GOOD TO BE TRUE? If an article says a single ingredient, such as parsley, can cure cancer, view this with suspicion. Most health conditions are the result of many nutrition, fitness, and lifestyle habits.

DOES THE ARTICLE DRAW SIMPLISTIC CONCLUSIONS FROM A SINGLE COMPLEX STUDY? This often happens when the writer only references the study abstract. An example of this may be a claim that eating a single food may reduce risk of cancer, when the actual study may have evaluated a single compound found in plant-based foods and its effects on cells versus the effects in the human body.

DOES THIS ARTICLE MAKE RECOMMENDATIONS BASED ON A SINGLE STUDY? Dietary recommendations made by authoritative bodies, such as the U.S. Dietary Guidelines Advisory Committee, are made by looking at the body of research conducted over time in various populations. A single study will never tell the whole truth about the relationship between a food and a health effect. But if multiple well-designed studies show similar effects, the relationship may be real.

DOES THIS ARTICLE MAKE DRAMATIC STATEMENTS THAT ARE REFUTED BY REPUTABLE SCIENTIFIC ORGANIZATIONS? Here it is important to look at the source of information. Is the article being published by or written on behalf of an organization that financially benefits from providing controversial health information? An example of this is an organization that sells newsletters. Controversial articles pique people's interest and help to sell subscriptions.

DOES THE ARTICLE INCLUDE LISTS OF "GOOD" AND "BAD" FOODS? There are no "good" or "bad" foods. What matters is a person's dietary patterns over time.

DOES THE ARTICLE INCLUDE RECOMMENDATIONS MADE TO HELP SELL A PRODUCT? If so, reader beware! The regulations that govern claims for dietary supplements differ from the regulations that govern foods, beverages, medicine, and medical devices. Food and medical companies must provide proof that their claims are valid before making the claims, whereas dietary supplement companies can make claims without proof. If the Food and Drug Administration requests proof, then they must provide it. But with limited funding for enforcement, the FDA pursues very few false claims.

DOES THE ARTICLE MAKE RECOMMENDATIONS BASED ON STUDIES PUBLISHED WITHOUT PEER REVIEW? Peer review is the process by which articles about research studies are evaluated by experts in the field prior to publication in a peer-reviewed journal. Peer review ensures that the research study was well designed and conducted in an appropriate manner, and that results are reliable and believable. Popular magazines like *Time* or *People* do not use a peer-reviewed process. Articles are simply reviewed by an editor for grammar and style. Fact checkers work to ensure quotes are accurate, but this process by no means ensures the recommendations or advice is valid for a given nutrition or health claim.

DOES THIS ARTICLE MAKE RECOMMENDATIONS FROM STUDIES THAT IGNORE DIFFERENCES AMONG INDIVIDUALS OR GROUPS? When it comes to nutrition and health, what may work for women may not work for men, or what works for non-smokers may not work for smokers. A classic example of this was a study conducted in the early 1990s to determine the effects of vitamin A supplementation on lung cancer risk. Taking vitamin A decreased lung cancer risk in non-smokers, but it dramatically increased risk of lung cancer and death in smokers.

The type of vitamin A present in animal foods is called *retinol.* Beef and chicken liver are excellent sources, as are fortified dairy products. Vitamin A itself is not found in plant foods, but beta-carotene, a phytochemical that the body uses to produce vitamin A, is found in orange and deep yellow vegetables such as squash, sweet potatoes, and carrots, as well as in dark green leafy vegetables (the orange pigment is hidden by the chlorophyll) like kale, collards, and spinach. Beta-carotene cannot be quickly converted to vitamin A, so it is difficult for toxic levels to be reached. Excess beta-carotene levels may, however, cause a person to appear jaundiced because the pigment is stored in fat layers just beneath the skin.

The Exercise Equation

NUTRITION IS CRITICAL TO GOOD HEALTH, but it is by no means the only aspect. Regular physical activity makes an important contribution to our health and well-being and can help to maintain a healthy body weight.

People who are physically fit are at a lower risk for developing a host of diseases. Most people in the United States lead a sedentary lifestyle, and that can increase their risk for overweight and obesity, hypertension, Type II diabetes, osteoporosis, heart disease, and even some forms of cancer. Physical activity may also help to manage mild to moderate depression and anxiety.

So how much exercise do people need? That depends on goals.

TO REDUCE THE RISK OF DISEASE, 30 minutes of moderate-intensity activity most days a week is enough, but greater benefits come with longer sessions or with more vigorous activity.

TO MANAGE WEIGHT AND PREVENT WEIGHT GAIN RELATED TO AGING AND A SLOWING METABOLISM, 60 minutes of moderate- to vigorous-intensity exercise most days of the week is recommended.

TO SUSTAIN WEIGHT LOSS, engage in 60 to 90 minutes of moderate-intensity exercise most days of the week. This activity should be above and beyond normal daily activities. Examples of moderate-intensity activities include hiking, dancing, gardening or yard work, golf (when you walk and carry clubs), bicycling at a rate of 10 miles or less per hour, walking at a rate of 3.5 miles per hour, light weight lifting, and stretching. Vigorous-intensity exercise includes jogging or running, swimming, bicycling at a rate of more than 10 miles per hour, walking at a rate of 4.5 miles per hour, aerobics, heavy yard work (such as chopping wood), vigorous weight lifting, and playing basketball.

Exercise can also help to meet nutrient needs. The more active a person is, the more calories he or she requires, and the easier it is to ensure that a wide variety of nutrient-rich foods is eaten.

Vitamin D is responsible for proper bone formation. It works in concert with calcium and phosphorus and helps the body use these minerals. A deficiency of vitamin D causes rickets, a condition in which the bones grow abnormally. Vitamin D is present in foods such salmon, sardines, shrimp, cod, and eggs, as well as in fortified milk and cereals. The skin, when exposed to sunlight, produces vitamin D from cholesterol. Ten to fifteen minutes per day is often enough. People with limited exposure to sunlight may need to get the amounts needed through fortified foods or supplements. The body's ability to manufacture vitamin D declines with age, so people over age sixty should consider supplementation. Recent studies show that American diets are deficient in this vitamin. Debate is under way concerning how much we should consume on a daily basis. Some experts have suggested more than doubling the current DV.

Vitamin E, like vitamin C, is an antioxidant that protects the body from oxygen damage and may have cancer-fighting potential. It is found in a variety of foods, especially whole grains and nuts. It is usually not difficult to obtain adequate vitamin E with a healthy and varied diet, but followers of extremely low-fat diets may be deficient.

Vitamin K is associated with proper formation of blood clots and makes a protein that is necessary for strong bones. Although it is produced by bacteria found in the intestines, a person who eats a varied diet obtains about half of the DV from food, particularly dark green leafy vegetables. Those who take anticoagulants should avoid foods high in vitamin K because it can interfere with the action of these drugs.

Electrolytes

THREE MINERALS ARE CALLED ELECTROLYTES: sodium, chloride, and potassium. There are no minimum requirements for sodium or chloride. Because these two combine to make table salt, they are usually eaten in sufficient amounts.

Electrolytes transmit nerve impulses, regulate fluids in cells, and help balance body fluids, including blood and blood pressure. Deficiencies are rare but may result from illnesses whose symptoms include diarrhea and nausea, or from extreme water loss such as that experienced by performance athletes or people who work outdoors on hot, humid days. Sodium deficiencies result in loss of appetite, muscle cramps, confusion, and forgetfulness. Potassium deficiencies result in weakness and confusion.

Most recreational athletes and people with normal amounts of physical activity are able to replace the electrolytes from the foods they normally eat, and restore fluid balance by drinking water to quench their thirst. Performance athletes and workers like roofers or road construction crews may need to go out of their way to eat foods that are high in salt. Sport drinks may also help to speed rehydration.

MACROMINERALS

Calcium, phosphorus, magnesium, sodium, and potassium are called *macrominerals* because they are required in relatively large amounts. Of these, calcium is the most abundant mineral in the body.

Ninety-nine percent of the calcium needed by the body is used in the development of bones and teeth; the remaining 1 percent is used to regulate blood pressure and to aid in muscle contractions, transmit nerve impulses, and clot the blood. A deficiency in calcium may cause stunted growth and a loss of bone density. Because the body requires so much calcium, excess calcium in the body is rare unless supplements are taken. Good sources of calcium include dairy products such as milk and yogurt, leafy greens such as collards and turnip greens, and canned fish with bones. Many foods are now fortified with calcium, including orange juice and cereal.

Phosphorus is used by the body in conjunction with calcium to maintain bone and tooth structure; it is also integral to releasing energy from food for the body to use. Deficiencies in this mineral are rare, but may result in weakness, decreased heart function, and neurological problems. Phosphorus is present in animal protein, nuts, cereals, and legumes.

Magnesium is used for bone and tooth structure, muscle contraction, nerve transmission, and

Nutraceuticals vs. Functional Foods

NUTRACEUTICALS ARE FOODS OR SUBSTANCES in foods that provide health benefits, including preventing or treating diseases; vitamins, minerals, and phytochemicals can be considered nutraceuticals. Some foods come by their medical benefits naturally—oatmeal doesn't need to have substances added to it to help reduce cholesterol levels. Other foods may be enriched, enhanced, or engineered. Medicinal plants or herbs added to sport bars or soft drinks, compounds called stanols added to margarines to reduce blood cholesterol levels, or vitamins and minerals added to bread, cereals, and pastas are all examples of fortifications to food.

The phrase *enriched with eight essential vitamins and minerals* has been around so long that many of us do not think twice about how enriched foods first came about. The story of their origin began in 1936, when a survey revealed that the incidence of deficiency diseases resulting from inadequate supplies of certain nutrients was increasing. Until that time, whole wheat bread had supplied the majority of the daily requirements of iron, thiamin, niacin, riboflavin, magnesium, zinc, vitamin B_6, folacin, and dietary fiber. With the advent of improved milling machinery, it became possible to make a whiter, smoother flour that produced a softer white bread. Unfortunately, highly refined flours lose significant amounts of nutrients. Niacin levels in unenriched white bread, for example, are only 2 percent of those found in whole-grain bread.

As white bread became cheap and readily available, the demand for whole-grain breads dropped. The

bowel function. Too little magnesium can cause possible growth failure, behavioral disturbances, tremors, weakness, and seizures. The U.S. diet tends to be deficient in magnesium. Good sources include green vegetables, nuts, legumes, and whole grains.

Sodium and potassium are known as *electrolytes.* These are essential to regulating bodily functions, helping to maintain the balance of fluid in the body, and they are involved in nerve and muscle functions. Both are plentiful in food, so dietary deficiencies are uncommon.

Whereas most American consume more sodium than recommended, the majority of Americans do not consume enough potassium from dietary sources. Adequate potassium has been linked to lower blood pressure levels and reduced risk of stroke and heart disease. Bananas have a reputation for being a rich source of potassium, but in fact they have almost half the amount of a baked potato. Avocados, white beans, yogurt, dark leafy greens like spinach, kale, and collard greens, and tomato and orange juices are also good sources.

MICROMINERALS

Fluoride, iodine, and iron are known as *trace minerals* or *microminerals* because they are needed in minute amounts. Fluoride helps prevent tooth decay and may play a role in preventing osteoporosis. Many commu-

prevalence of deficiencies made it obvious that nation's nutrient supply needed a boost. The Enrichment Act of 1942 required enrichment of all grain products, including cereals, pastas, and breads, that were brought across state lines. Iron, thiamin, niacin, and riboflavin levels are required to be close to what they had been in the whole-grain versions.

As of January 1, 1998, an amendment to the law also requires that folic acid, a B vitamin shown to prevent birth defects, must be added. Other nutrients are added as part of the enrichment process, but it is not mandatory that their levels be raised to match those in whole-grain foods. There is no requirement for replacing dietary fiber.

Today, nutrition modification is going beyond fortifying foods with nutrients lost in processing. Foods are now fortified with nutrients they have never supplied. Orange juice, for example, may be fortified with calcium or with vitamins E and A as well as extra vitamin C. Hens are fed special diets high in flax, and the eggs they lay are rich in omega-3 fatty acids and somewhat lower in cholesterol than eggs from hens fed a traditional diet.

Enriched products are certainly a better nutritional bargain than unenriched, bleached, and refined products. However, they are no match for whole grains. Replacing some of the nutrients does not make the product nutritionally complete, even if the label claims that a cereal offers 100 percent of eight or ten essential nutrients. The possible side effects from a diet that relies heavily upon highly processed grains and flours are still coming to light as scientists and researchers uncover more about the special roles played by each nutrient in our bodies.

nity water supplies contain fluoride. This mineral is also present in saltwater fish, shellfish, and tea.

Iodine is essential for the normal functioning of the thyroid gland, and it helps to regulate energy metabolism, cellular oxidation, and growth. Iodine is found most abundantly in saltwater fish and some dairy products; its content in fruits and vegetables depends on the soil they are grown in. A deficiency of iodine results in goiter, or enlargement of the thyroid gland. Since the early 1900s, when goiter was common in the midwestern United States, iodine has been added to table salt (iodized salt) to eliminate this deficiency.

Iron is a component of hemoglobin, the part of the red blood cells that carries oxygen from the lungs to the cells. About 75 percent of the body's iron is found in the blood. The remaining iron functions as a component of myoglobin, the oxygen-supplying molecule found in muscles, as part of certain enzymes involved in cellular energy metabolism. Iron deficiencies are a worldwide health problem, particularly for women of childbearing age, and cause a form of anemia in which blood cells lack sufficient hemoglobin. Someone who is anemic may appear pale and feel weak; they will also have an impaired immune system. The best food sources of iron are liver and red meat, but it is also found in whole grains, legumes, leafy green vegetables, dried fruit, and egg yolks.

PHYTOCHEMICALS AND ANTIOXIDANTS

Phytochemicals are compounds that occur naturally in plant foods such as fruits, vegetables, legumes, and grains (*phyto-* is from the Greek word for "plant"). Like vitamins, they occur naturally, but unlike vitamins, they have not yet been recognized as essential. To date, there are no deficiency levels or daily values determined for phytochemicals.

The study of phytochemicals is a very new science, and although it is tempting to take supplements of certain phytochemicals that appear to provide specific health benefits, this is not always advisable. The best way to capitalize on the benefits of phytochemicals is to eat a wide variety of fruits, vegetables, grains, and legumes.

Every plant food appears to have a different mix of phytochemicals that work in concert with each other, as well as with vitamins and minerals, hormones, and other compounds to provide health benefits. Tomatoes, for example, contain more than one hundred phytochemicals. Researchers are continuing to identify the compounds in foods and their role in good health and proper nutrition.

Phytochemicals include flavonoids, which impart flavor (such as the sulfur compounds in onions or the capsaicin in peppers) and pigments (beta-carotene and lycopene are carotenoid pigments; anthocyanin is a pigment that gives red cabbage and berries their deep red to purple hue). In general, phytochemicals seem to function in a combination of three ways: Some have antioxidant properties, some affect hormone levels, and some change enzymes that may eliminate carcinogens. Phytochemicals like digitalis and quinine have been used for medical purposes for centuries; their anticancer effects are only beginning to be explored.

Antioxidants are a subcategory of phytochemicals. They are essential for combating the cellular damage caused by free radicals, which are reactive forms of oxygen produced by the body's metabolic processes. Free radicals are present in particularly great quantities during times of stress, illness, and exposure to toxins, and are even a natural by-product of exercise. Antioxidants include vitamins A, C, and E, the mineral selenium, and carotenoid pigments.

More than six hundred carotenoids are found in nature, and the body uses about fifty of these. Lycopene, found in watermelon and cooked tomatoes, is one type of carotenoid used by the body. Lutein and zeaxanthin, xanthophylls found in corn and in leafy greens such as kale and spinach, also types of carotenoids, are believed to protect the macular area of the eye. These antioxidants in general seem to interfere with the growth of cancer cells and may reduce the risk of some cancers.

One of the most intriguing aspects of phytochemicals for the chef is that they are associated with specific flavors in foods, from the pungency of onions (allyl sulfides) to the heat in chiles (capsaicin) to the sharp aromas of pine in some herbs (terpense).

ASSESSING FOODS BASED UPON NUTRIENT OR CALORIE DENSITY

Different foods contain different nutrients. The foods we choose to eat may be a rich source of a wide array of essential nutrients. Whole, minimally processed foods fall into this category. A steady diet of highly processed foods, on the other hand, can leave us shortchanged on certain important nutrients. When our nutrition needs are not met, our chances of developing diseases or chronic health conditions, including hypertension, heart disease, diabetes, osteoporosis, gingivitis, and even some types of cancer, increase.

Foods that have a good supply of essential nutrients in relation to the number of calories they contain are considered nutrient-dense. Fruits and vegetables, lean meats and skinless poultry, low-fat dairy products, and whole grains supply a great deal

PHYTOCHEMICALS

PHYTOCHEMICAL FAMILY	FOOD SOURCE	POSSIBLE HEALTH BENEFIT
Allyl sulfides	Onions, garlic, leeks, chives	Increase enzymes that affect cancer-causing substances and aid in their elimination from the body
Capsaicin	Chiles	Appears to prevent blood clotting; may interfere with development of cancer cells
Catechins	Apples, dark chocolate, grapes, raspberries, red wine, tea	May reduce the risk of cancers and help to prevent buildup of plaque on arterial walls
Indoles	Cruciferous vegetables (kale, broccoli, cabbage, cauliflower)	Stimulate enzymes; make estrogen less effective, possibly reducing breast cancer risks
Isoflavones	Soybeans (tofu, soymilk, soy nuts)	Inhibit cancer cell growth and division under some conditions
Isothiocyanates	Cruciferous vegetables	Protect against cancer through their effects on enzymes
Phenolic acids (ellagic acid, ferulic acid)	Tomatoes, citrus fruits, carrots, nuts, strawberries, raspberries, whole grains, pomegranates	Reduce the genetic damage caused by carcinogens like tobacco smoke and air pollution
Polyphenols	Green tea, grapes, wine	May reduce the risk of certain types of cancers and heart disease
Quercetin	Apples, berries, red onions, red and purple grapes, tea, tomatoes	May reduce risk of some kinds of cancer; also may help to maintain beneficial levels of serum cholesterol and prevent cell damage
Resveratrol	Grapes, especially the skins; red wine, peanuts	Inhibits all three stages of carcinogenesis (tumor initiation, promotion, and progression); lowers serum cholesterol levels
Saponins	Beans, legumes	Prevent cancer cells from multiplying by influencing the genetic material in the cells
Terpenes (perillyl alcohol, limonene)	Cherries, citrus peel, lavender	Block development of breast tumors; cause existing tumors to regress

of nutrients and are fairly low in calories, thus they are all nutrient-dense.

Foods that supply a great deal of calories per serving are considered calorie-dense. Nuts, for example, are a very concentrated source of calories and other nutrients. Foods with little or no nutritional value in relation to their caloric content are said to have empty calories. Alcoholic beverages, soda, breakfast pastries, desserts, and jams and jellies are examples of foods with empty calories.

DIETARY GUIDELINES AND RECOMMENDATIONS

IF YOU FIND THE AMOUNT OF INFORMATION in this chapter daunting, you're not alone. Translating all that information into balanced, nutritious menus for people who are in good health is a challenging task. Add diseases or health conditions like diabetes, high blood pressure, or heart disease to the mix, and it's easy to be overwhelmed.

Supplements vs. Food

WALK INTO ANY HEALTH FOOD STORE and you'll see what a huge business vitamin and mineral supplements are. But is it necessary—or even advisable—to get nutrients from a pill?

If a person eats a balanced diet that includes a variety of foods, supplements probably aren't necessary. While some health conditions may indicate the need for vitamin and mineral supplements, currently no strong evidence supports the claim that supplements provide real benefits to individuals who are in good health and who eat properly. And supplements probably won't counteract or correct health problems brought about by poor nutrition.

In fact, taking indiscriminate megadoses of vitamins and minerals can be risky. Toxic levels caused by overdosing can lead to a number of health problems, including nausea, depression, even death. And virtually all instances of toxic levels of vitamins are caused by supplementation.

However, there are situations where supplementation is warranted. Vitamin B_{12} is found only in animal foods. Ovo-lacto vegetarians may obtain some levels, but they, as well as vegans, should consider taking supplemental B_{12}, as should people over the age of fifty because the body's ability to absorb vitamin B_{12} declines with age. The body's ability to synthesize vitamin D also declines significantly with age: Seventy-year-olds produce about 30 percent of what people in their twenties do. People who are over sixty, who live in northern climates where the sun sets early in the winter, or who are housebound should also consider supplementing their diets with vitamin D. Women who may become pregnant should discuss folic acid supplements with their health-care practitioner; this B vitamin has been shown to reduce some birth defects.

As scientists learn more about the relationship between foods and well-being, various governmental bodies and health organizations are able to make recommendations about which foods may be the most beneficial sources of calories and nutrients. These recommendations can address specific health conditions and diseases, allergies, and weight-loss goals, and they can be adapted for food preferences.

The majority of these recommendations take the form of eating plans or dietary guidelines. Most guidelines group foods into categories, along with the number of servings from each group to be eaten every day or week. The groups may go by different names, but they typically are fruits, vegetables, breads and cereals, milk and milk products, and meat and meat alternatives. Some guidelines provide information for food quantities by weight, by piece, or by serving; others by a percentage of calories.

Grains and grain-based foods such as pasta, rice, cereals, and bread, as well as fruits and vegetables, usually compose the bulk of the recommended daily food choices. The vegetable group is sometimes divided into subgroups based on color, with recommendations for dark green leafy vegetables, orange vegetables, legumes, starchy vegetables, and a catchall group of other vegetables. Some eating plans group starchy vegetables, such as potatoes, with starchy foods like grains. Legumes supply protein and complex carbohydrates, and different eating plans may group them in either category.

DIETARY RECOMMENDATIONS FOR SPECIAL NEEDS

General dietary recommendations are meant to give guidance to individuals who are in generally good health. However, the demands that certain health conditions make on the body may call for more specific eating plans.

DIABETES

For years, people with diabetes were told to avoid foods that contained sugar. Simple carbohydrates were thought to have a greater impact on blood sugar levels than complex carbohydrates. (Soluble fiber slows the rate of digestion, so although all carbohydrates will cause blood sugar levels to increase, eating a meal that includes soluble fiber will cause them to rise more slowly.) Current research indicates that the source of carbohydrates doesn't matter as much as the amount of them. People with diabetes are now taught to balance their daily allotment of carbohydrates in each meal and snacks while keeping blood sugar under control.

There is no specific "diabetic diet," but the Joslin Diabetes Center, world-renowned center for diabetes research located in Boston, offers the following recommendations:

KEEP CARBOHYDRATES to 40 percent of total calories per day, and aim for 20 to 35 grams of fiber. The best high-fiber sources are fresh vegetables, fruits, beans, and whole grains.

PROTEIN SHOULD comprise 20 to 30 percent of the day's calories, unless a person has kidney disease.

FATS SHOULD be 30 to 35 percent of the total calories per day, and most fats should be monounsaturated or polyunsaturated. Avoiding saturated fat will help reduce cholesterol levels that may lead to health complications.

The Joslin Diabetes Center also encourages a minimum of two and a half to three hours of moderate-intensity exercise every week.

The American Diabetes Association has also created a pyramid for people with diabetes. It groups foods by nutrient content rather than type of food. Potatoes and legumes are grouped with grains and other starches, and cheese is grouped with meats and other proteins rather than with milk. Portion sizes for some carbohydrates are also smaller than in the USDA's Dietary Guidelines, to ensure that carbohydrate counts are consistent.

The Mayo Clinic's recommendations for calorie distribution allow for 50 to 60 percent of calories from carbohydrates and 15 to 20 percent from protein. Among the servings of carbohydrates, it suggests six or more servings of starches, two to four

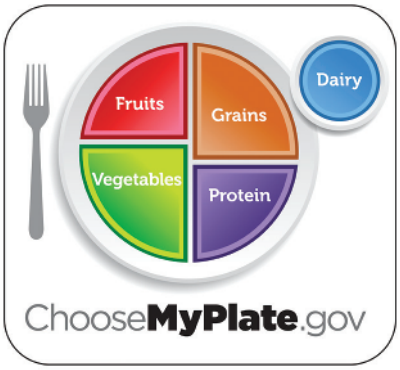
Other Dietary Pyramids

AFTER THE USDA FIRST DEVELOPED ITS FOOD GUIDE PYRAMID IN 1991, other organizations developed pyramid models of traditional cuisines or of diets for special population groups. Oldways Preservation & Exchange Trust, in conjunction with the Harvard School of Public Health, developed Asian, Latin American, Mediterranean, and vegetarian pyramids. The Academy of Nutrition and Dietetics (formerly the American Dietetic Association) has pyramids for vegetarians, older citizens, and children, as well as pyramids modeled on the cuisines of India, China, Italy, Mexico, and several North American cultures.

The Mediterranean pyramid represents a diet based on the traditional diets of Greece and southern Italy—areas where people once had the world's lowest rates of heart disease, obesity, and hypertension. Foods rich in carbohydrates make up the bulk of meals, and fruits, vegetables, legumes, and nuts round out the daily diet. Olive oil is the principal source of fat, and cheeses and yogurt are the most common dairy foods. Although these may be high in fat, they are rich in nutrients, so moderate amounts are justified. Fish, poultry, eggs, and sweets are consumed a few times a week, and red meats are eaten only a few times a month.

If your clientele includes a significant number of vegetarians, you may wish to consult a vegetarian pyramid. Several organizations have developed them; the pyramid of Academy of Nutrition and Dietetics is based on an earlier version of the USDA's Food Guide Pyramid. The main difference is that dried beans, nuts, seeds, peanut butter, and soy products replace meat, fish, and poultry.





servings of fruits, two or three servings of milk or milk products, and three to five servings of vegetables, depending on calorie needs.

HYPERTENSION

Created by the United States Department of Health and Human Services, the DASH (Dietary Approaches to Stop Hypertension) eating plan is based on the USDA's Dietary Guidelines. The DASH eating plan has been shown to reduce the likelihood of healthy people developing hypertension, and it can reduce blood pressure levels in people who are hypertensive.

Sodium and high blood pressure are linked. Most people in the United States consume more than 3,600 milligrams of sodium per day, far more than the 2,300 milligrams most experts recommend. Reducing sodium to this level can bring high blood pressure down, and reducing sodium to 1,500 milligrams can reduce it even more.

The DASH eating plan is based on 2,000 calories per day and gives two levels of daily sodium consumption: 2,400 or 1,500 milligrams. It is based on the USDA's Dietary Guidelines, but the amounts of foods to be eaten are given in number of servings, not percentages.

Whole grains should make up the bulk of the diet, with seven or eight servings per day. Four or five servings each of fruits and vegetables and two or three servings each of low-fat dairy and fats are also recommended. No more than two servings of meats, poultry, and fish should be eaten daily.

Four or five servings per week of nuts, seeds, and dried beans are recommended.

DIETARY RESTRICTIONS

ALTHOUGH SOME PEOPLE VIEW EATING OUT as an occasion to splurge, many will not be able to relax their dietary restrictions. People with allergies or chronic digestive conditions such as celiac disease or Crohn's disease must be extremely careful in their food choices to prevent flare-ups, and research indicates that some foods may trigger migraines in people who suffer from them.

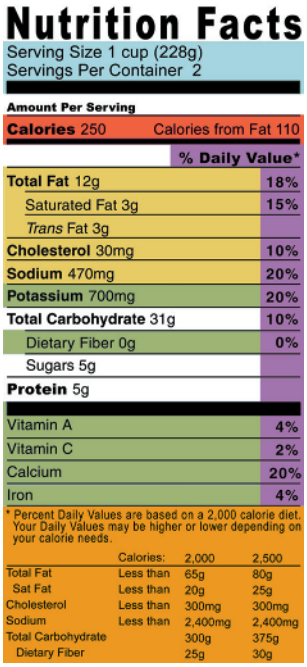
Restrictions based on personal goals, such as weight loss, and some that are health-related, such as a diabetic person watching carbohydrate intake or someone with high cholesterol keeping an eye on her saturated fat, might be somewhat more flexible than those based on allergies. But even people who might adapt the rest of their daily diet to allow for a special occasion meal will appreciate menu choices that take their needs into consideration. Developing menus that are nutritious, balanced, and flavorful should be a priority.

FOOD ALLERGIES AND INTOLERANCES

As of January 2006, all packaged foods that contain major food allergens—milk, eggs, fish, crustacean shellfish, tree nuts (such as almonds, pecans, or walnuts), wheat, peanuts, and soybeans—must have the allergens identified on the label. Foods in their natural state do not need to be labeled. However, dishes on a menu that might contain allergens should be identified, particularly if the ingredient's inclusion might not be apparent from the recipe's name. (To read more about food allergies, see page 46 in Chapter 2 and consult the Recommended Resources and Readings on page 515.)

NUTRITION LABELING

NUTRITION LABELS CONTAIN specific information about food products. Labeling can appear on packaged goods or on menus, or the information may appear in advertisements. The food manufacturer or restaurant creates the content, but any claims or promises used may be mandated by law.



Nutrition Facts

Serving Size 1 cup (228g)
Servings Per Container 2

Amount Per Serving

Calories 250	Calories from Fat 110
	% Daily Value*
Total Fat 12g	18%
Saturated Fat 3g	15%
Trans Fat 3g	
Cholesterol 30mg	10%
Sodium 470mg	20%
Potassium 700mg	20%
Total Carbohydrate 31g	10%
Dietary Fiber 0g	0%
Sugars 5g	
Protein 5g	
Vitamin A	4%
Vitamin C	2%
Calcium	20%
Iron	4%

* Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs.

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Sat Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Deciding which information to communicate to consumers concerning the nutritional content of menu items is a decision that each food-service operator must make. You have the option to say nothing at all, but you may wish to include information about the nutrition or health attributes of your food products in menus or advertising.

Any type of nutrition claim is regulated by the FDA under the Nutrition Labeling and Education Act (NLEA) of 1990. They are updated frequently as new studies add to our share of information, so check the FDA's Web site (www.fda.gov) for the most current regulations. These regulations are complex and run to more than four thousand pages. Here is a brief overview of them as they apply to food-service operators, with a bit of background first.

A BRIEF HISTORY OF FOOD LABELING IN THE UNITED STATES

Since 1906, the U.S. government has developed legislation to inform consumers about the safety and quality of foods by requiring information on food labels. In 1969, the White House Conference on Food, Nutrition, and Health recommended that a system be developed to deliver nutrition information to consumers. For nearly two decades, nutrition labeling was largely voluntary and minimally regulated unless a food contained added nutrients or included a claim about its nutrient content or usefulness in the daily diet. Because information was inconsistent, it was difficult for consumers to make accurate comparisons.

Until fairly recently, there were no rules governing what qualified as *light* or *healthy* and the terms were used indiscriminately. Today all of those have been described and defined. In order to qualify for a nutrition claim, specific standards must be met. The term *light*, for example, might only have meant a slight reduction in calories, fat, or sodium. Sometimes, those reductions were nothing more than a manipulation of the serving size recorded on the label.

If you see the term *light* on a label today, you can be sure that it was compared to a reference amount. For a more complete description of nutrition and health claims, refer to the Appendix, page 498.

In 1990, Congress enacted the Nutrition Labeling and Education Act (NLEA), which required that standardized nutrition information be included on packaged food labels. Terms like *fat-free*, *low-sodium*, *light*, and *healthy* were clearly defined to ensure that food producers used nutrition and health claims responsibly and consistently.

Restaurant menu claims were originally not included in these regulations, but two public advocacy groups, the Center for Science in the Public Interest (CSPI) and Public Citizen, filed suit in 1993 to prevent this exclusion. In 1996, the U.S. District Court issued a ruling that agreed with the plaintiffs, and the court ordered the FDA to amend its regulations. These went into effect in 1997.

NUTRIENT CONTENT CLAIMS

The FDA established a specific list of words and phrases that may be used to describe the nutrient contents of foods that fit certain criteria (see

the Appendix, page 498, for the list and definitions). Nearly all of the criteria are based on standard serving sizes known as *reference amounts* (these are also listed in the Appendix and can be found at www.fda.gov/Food/default.htm).

According to the FDA, three types of claims may be used to describe the nutrition profile of foods:

1. AN ABSOLUTE CLAIM characterizes the exact amount or range of a nutrient in a particular food. Terms that indicate an absolute claim are *free* and *low*. For example, to meet the definition of *low sodium*, a food must contain 140 milligrams or less per reference amount. When an absolute claim is made in print, it is not necessary to define it, but the food must meet the established criteria. (Parameters can be found at www.fda.gov/Food/LabelingNutrition/default.htm.)

2. A RELATIVE CLAIM is a statement that compares the nutrient content of one food to another food, known as the reference food. (The reference food may be the restaurant's regular product or another restaurant's product; its nutrition values may be derived from a valid database, an average of top national or regional brands, or a market-basket norm.) Words like *reduced* and *less* can also indicate a relative claim; *reduced*, as well as *added* and *light* or *lite*, may be used to compare products that are similar (such as cookies to cookies), whereas *more* and *less* can be used to compare foods within the same category that may be substituted for one another (such as cookies for cake). Definitions of these claims do not need to be in print, but the food must meet the established criteria, including a comparison of the two foods, the percentage of the reduction, and the actual nutrient content of both foods.

3. AN IMPLIED CLAIM is a statement that highlights the presence or absence of an ingredient that is associated with the level of a nutrient. *High in oat bran* carries the implied claim that the food is high in fiber, so any food with this claim must meet the established criteria for high-fiber foods. Other ingredient-nutrient relationships include sugar and calories, oils and total fat, tropical oils and saturated fat, and whole grains or bran and dietary fiber. Implied claims are difficult to define and can be a source of confusion, and it can be easy to unwittingly make an implied claim. Saying a pizza is *made with low-fat cheese* implies that the pizza is at least reduced fat compared to a similar pizza. The FDA would prohibit such a statement if the pizza failed to meet the criteria for a reduced-fat food.

Some statements about ingredients are not considered nutrient claims. These are general statements that pertain to ingredients that are perceived to have value (e.g., *made with fresh fruit and honey*) that do not serve nutritive purposes (e.g., *no preservatives*), or that may need to be avoided for various reasons. Additionally, statements in which the ingredient is part of the identity of a food, such as whole wheat pasta or multigrain bread, are not considered nutrient claims.

PORTIONS, SERVINGS, AND "EATING OCCASIONS"

When you discuss amounts of food, terms like *portion* and *serving* get bandied about. Although they both indicate quantities consumed, they are not synonymous. A serving is a prescribed amount of food, but a portion is what is actually consumed.

Consider soda: A 20-ounce bottle of soda features a Nutrition Facts label claiming each bottle contains 2½ servings. However, often the bottle is consumed in one sitting and those 2½ servings become one portion. A 12-ounce can of soda lists Nutrition Facts for 12 ounces. In this case, the serving size and portion size are the same.

Reference amounts and eating occasions are terms used to determine nutrition and health claims. Reference amounts are often given in metric amounts, and they indicate the quantity of food customarily consumed. An eating occasion may be a meal, a snack, or per use. The reference amount of butter customarily consumed per eating occasion, for example, is 1 tablespoon; for soda, it is 240 milliliters, or 8 ounces. A more complete listing of reference amounts can be found in the Appendix, pages 509–512.

HEALTH CLAIMS

A health claim defines the relationship between the nutrient content of a food and a disease or health-related condition. A nutrient content claim refers only to a level or range of a nutrient in a food, while a health claim includes two elements: a reference to the nutrient or substance, and a reference to a disease or health-related condition. Generally, a health claim must:

1. Be complete, truthful, and not misleading
2. Express the relationship between nutrient and disease
3. Indicate that the risk of disease depends on many factors

Health claims may be expressed through statements, icons, or symbols, or as a vignette. The form of the claim is not important as long as all the required elements are present. Where space allows, statements may be included such as, "While many factors affect heart disease, diets low in saturated fat and cholesterol may reduce the risk of this disease. Our [recipe name] can be part of such a diet." If an abbreviated claim such as *heart-healthy* or a symbol is used, the restaurant must provide a complete explanation of the claim. It can be featured prominently in the menu or ad, or a statement directing patrons to ask their server can be used if the full claim appears in a brochure or notebook that the restaurant uses to convey nutrition information.

The FDA recognizes twelve nutrient-disease relationships that may be used in health claims:

1. Calcium and osteoporosis
2. Sodium and hypertension
3. Dietary fat and cancer
4. Dietary saturated fat and cholesterol and the risk of heart disease
5. Fiber-containing grain products, fruits, and vegetables and cancer
6. Fruits, vegetables, and grain products that contain fiber, particularly soluble fiber, and the risk of heart disease
7. Fruits and vegetables and cancer
8. Folate and neural tube defects
9. Dietary sugar alcohol and dental caries (cavities)

HEALTH CLAIM NUTRIENT LIMITS

	TOTAL FAT (GRAMS)	SATURATED FAT (GRAMS)	CHOLESTEROL (MILLIGRAMS)	SODIUM (MILLIGRAMS)
Food*	13	4	60	480
Main dish*	19.5	6	90	720
Meal*	26	8	120	960

*Based on the reference amount, as detailed in the Appendix (pages 509–512), or 50 grams when reference amount is 30 grams or less, or 2 tablespoons or less.

10. Dietary soluble fiber, such as that found in whole oats and psyllium seed husks, and risk of coronary heart disease
11. Soy protein and risk of coronary heart disease
12. Plant sterols and risk of coronary heart disease

In order to make any of these health claims, a food, main dish, or meal must meet the following three requirements: First, as shown in the table on page 34, a serving of the food or meal must contain less than the specified levels of four disqualifying nutrients: fat, saturated fat, cholesterol, and sodium. If the item exceeds any one of the four nutrients, a health claim cannot be made. Second, without fortification, the item must contain at least 10 percent of the Daily Value (DV) for at least one of the following six nutrients: vitamin A, vitamin C, calcium, iron, fiber, and protein. Third, in addition to the preceding general requirements, the item must meet the specific criteria for each approved claim. These criteria for daily values are detailed in the Appendix (pages 503–507).

CLAIMS ABOUT DIETARY GUIDELINES

In addition to nutrient and health claims, food-service operators also have the option of indicating that a particular food falls within dietary guidelines.

A statement that a food or meal meets the dietary guidelines of a recognized dietary authority is not considered a nutrient content or health claim by the FDA, provided that the statement is limited to general dietary guidance and does not characterize the level of a nutrient in a food. Therefore, food-service operators should be cautious of making implied nutrient content or health claims. A statement such as "Meets the National Cancer Institute recommendations for fiber" makes the food subject to nutrient content claim requirements because it characterizes the content of a specific nutrient. If you want to provide information as dietary guidance and not as a health claim, avoid giving undue emphasis to terms or symbols that could be interpreted as an implied claim.

A restaurant can provide general dietary guidance in several ways. A simple statement such as "This entrée is consistent with the Dietary Guidelines for Americans as established by the USDA" is one approach.

Although Dietary Guideline statements are not strictly regulated by the FDA, it is expected that truthfulness will prevail. A food should not be associated with Dietary Guidelines unless it meets all of the applicable recommendations.

OBTAINING NUTRIENT INFORMATION FOR RECIPES

If you wish to make claims regarding the nutrition or health benefits of your products, the FDA requires that you have those foods or recipes analyzed for their nutrient content. There are a number of sources you can turn to for nutrition values.

Recipe analysis can also be calculated using nutrition handbooks and food labels. This is extremely time-consuming because the tables only give values for specific portion sizes, necessitating conversions and other calculations. For a handful of recipes this method may be cost-effective, but it's probably not feasible if many recipes need to be analyzed.

You may also wish to purchase software to analyze your recipes in-house if you would like to design recipes that are generally healthier. Programs are available with a wide range of options, and many are designed specifically for the food-service industry. These programs provide large databases of food nutrient values and perform the math involved in recipe analysis, and some may even create purchasing lists, spreadsheets, cycle menus, and menus based on allergies, preferences, and dislikes. The choices in the database may be overwhelming, however. One database returned 41 variations of *beef tenderloin* and 149 of *chicken*!

Another option is to hire a consultant to perform the analysis, and this is crucial when making nutritional claims on your menu. Fees depend on the complexity of the recipes and the number of nutrients analyzed. This can be a costly approach, but a reliable consultant who is well versed in the intricacies of recipe analysis and is familiar with software and database choices is likely to do the work more accurately, and more rapidly, than someone who is not. Consultants can be found through professional associations such as the Academy of Nutrition and Dietetics (formerly the American Dietetic Association).

As of March 2012, there are a number of states that require menu nutrition labeling for restaurant chains, and there are pending federal regulations that may require restaurants with 20 or more units to provide calorie and nutrition information for all menu items. It's important to know what is required for your operation. Consulting an expert in this field who is well versed on local, state, and national regulations is an important consideration if you want to provide your customers with accurate calorie and nutrient information. In some cases, if you voluntarily comply with the regulations to provide calorie information on your menu as an independent operator, you still must meet all of the requirements for providing complete nutrition information upon request.

THE VARIABLES OF ANALYSIS

Many factors come into play when you choose to perform nutrient analyses for recipes. First, you need to determine which nutrients to analyze for. Computer software programs can generate a mind-boggling array of nutrient counts, but for many operators the most relevant are probably calories, saturated fat, sodium, and carbohydrates.

Ingredient databases or tables may not list all ingredients, especially unusual ones. Some software programs allow you to update the database, using nutrient values derived from Nutrition Facts labels. You may also find information for uncommon foods on the Internet, or by contacting a food marketing or advisory council or the food's purveyor, grower, or producer.

Even if all your ingredients are in a database, it is important to remember that nutrient analysis is an estimate, not an actual accounting. Most accepted food nutrient values are averages that reflect the natural variations in foods due to growing conditions, storage, processing, and cooking.

Methods of preparation can affect nutrient analysis. If a marinade is discarded after the soaking, only part of it should be included. The amount discarded can be measured or estimated. If fat content is important, careful attention needs to be paid to which ingredients are selected from a database. *Beef tenderloin, cooked* does not take into account how the beef is cooked or for how long. The amount of fat trimmed from the tenderloin, however, will make a significant difference.

If you make the effort to analyze your recipes, take the steps to ensure that your food products conform to these nutrition profiles. Use standardized recipes and techniques to maintain consistency in preparation. If you use a reliable source in your recipe analysis methods and have made a reasonable effort to adhere to the recipes' preparation methods, the FDA will consider your operation to have a "reasonable basis" for believing that a food meets the requirements for health or nutrition claims and will not hold you legally liable for any minor variations that may occur in production. However, if a product is found to have more or less of a certain nutrient than indicated by a claim, you may receive damaging media attention.

SUMMARY

IN THE UNITED STATES, consumers have grown increasingly conscious of the need to make meal choices that are healthful in order to maintain good health. Pyramids and guidelines have influenced how people select food in restaurants.

Food-service professionals need to be aware of the nutrition concerns of consumers and the ways to satisfy their needs. Because food choices are intensely personal, preferences and expectations can vary widely from one group to another. Although health and nutrition are important to many consumers, taste is still primary. The food guide pyramids, MyPlate, and Dietary Guidelines are tools that can help develop menu items that are nutritious as well as flavorful and satisfying.

The FDA regulates the language that can be used on menus and in advertising to characterize the nutrition and health attributes of foods. Two main categories of claims can be made: nutrient claims and health claims.

Nutrient content claims describe the nutrition content of a food. The three types of nutrient content claims defined by the FDA are the absolute claim, the relative claim, and the implied claim.

Health claims characterize the relationship between the nutrient content of a food and a disease or health-related condition. Twelve nutrient-disease relationships can be used in health claims.

A menu may also state that a food is consistent with the Dietary Guidelines set up by the USDA or other health organizations. These types of statements are not regulated by the FDA as long as they are restricted to general dietary advice and do not characterize specific nutrient levels.

Any recipe for which health or nutrition claims are made is required by law to be analyzed for nutrient content. There are several methods of analyzing recipes, and many variables will affect their accuracy. If you take the trouble to analyze your recipes, you should also ensure that they conform to their nutrition profiles.