Chapter 1

What's Nutrition, Anyway?

In This Chapter

- Exploring why nutrition matters
- Determining the value of food
- Locating sources for nutrition information
- Finding out how to read a nutrition study

Welcome aboard! You are about to begin your very own *Fantastic Voyage.* (You know. That's the 1966 movie in which Raquel Welch and a couple of guys were shrunk down to molecule size to sail through the body of a politician shot by an assassin who had . . . hey, maybe you should just check out the next showing on The Movie Channel.)

In any event, as you read, chapter by chapter, you'll follow a route that carries food (meaning food *and* beverages) from your plate to your mouth to your digestive tract and into every tissue and cell. Along the way, you'll have an opportunity to see how your organs and systems work. You'll observe firsthand why some foods and beverages are essential to your health. And you'll discover how to manage your diet so you can get the biggest bang (nutrients) for the buck (calories). Bon voyage!

Nutrition Equals Life

Technically speaking, *nutrition* is the science of how the body uses food. In fact, nutrition is life. All living things, including you, need food and water to live. Beyond that, you need good food, meaning food with the proper nutrients, to live well. If you don't eat and drink, you will die. Period. If you don't eat and drink nutritious food and beverages

- Your bones may bend or break (not enough calcium).
- Your gums may bleed (not enough vitamin C).
- Your blood may not carry oxygen to every cell (not enough iron).

Essential nutrients for Fido, Fluffy, and your pet petunia

Vitamin C isn't the only nutrient that's essential for one species but not for others. Many organic compounds (substances similar to vitamins) and elements (minerals) are essential for your green or furry friends but not for you, either because you can synthesize them from the food you eat, or because they're so widely available in the human diet and you require such small amounts that you can get what you need without hardly trying.

Two good examples are the organic compounds choline and myoinositol. *Choline* is an essential nutrient for several species of animals, including dogs, cats, rats, and guinea pigs. Although choline has now been declared essential for human beings (more about that in Chapter 10), human bodies produce choline on their own, and you can get choline from eggs, liver, soybeans, cauliflower, and lettuce. *Myoinositol* is an essential nutrient for gerbils and rats, but human beings synthesize it naturally and use it in many body processes, such as transmitting signals between cells.

Here's a handy list of nutrients that are essential for animals and/or plants but not for you:

Organic compounds	**Elements**
Carnitine	Arsenic
Myoinositol	Cadmium
Taurine	Lead
	Nickel
	Silicon
	Tin
	Vanadium

And on, and on, and on. Understanding how good nutrition protects you against these dire consequences requires a familiarity with the language and concepts of nutrition. Knowing some basic chemistry is helpful (don't panic: Chemistry can be a cinch when you read about it in plain English). A smattering of sociology and psychology also is useful, because although nutrition is mostly about how food revs up and sustains your body, it's also about the cultural traditions and individual differences that explain how we choose our favorite foods (see Chapter 15).

To sum it up: Nutrition is about why you eat what you eat and how the food you get affects your body and your health.

First principles: Energy and nutrients

Nutrition's primary task is figuring out which foods and beverages (in what quantities) provide the energy and building material you need to construct and maintain every organ and system. To do this, it concentrates on food's two basic attributes: energy and nutrients.

Energy from food

Energy is the ability to do work. Virtually every bite of food gives you energy, even when it doesn't give you nutrients. The amount of energy in food is measured in *calories,* the amount of heat produced when food is burned (metabolized) in your body cells. You can read all about metabolism in Chapter 2; Chapter 3 is your source for information about calories. But right now, all you need to know is that food is the fuel on which your body runs. Without enough food, you don't have enough energy.

Nutrients in food

Nutrients are chemical substances your body uses to build, maintain, and repair tissues. They also empower cells to send messages back and forth so as to conduct essential chemical reactions such as the ones that make it possible for you to

- Breathe
- Move
- Eliminate waste
- Think
- See
- Hear
- Smell
- Taste

. . . and do everything else natural to a living body.

Food provides two different and distinct groups of nutrients:

- **Macronutrients (macro = big):** protein, fat, carbohydrates, and water
- **Micronutrients (micro = small):** vitamins and minerals

What's the difference between these two groups? The amount you need each day. Your daily requirements for macronutrients generally exceed one gram. (For comparison's sake, 28 grams are in an ounce.) For example, a man needs about 63 grams of protein a day (slightly more than two ounces), and a woman needs 50 grams (slightly less than two ounces).

Your daily requirements for micronutrients are much smaller. For example, the Recommended Dietary Allowance (RDA) for vitamin C is measured in milligrams ($1/_{1,000}$ of a gram), while the RDAs for vitamin D, vitamin B12, and folate are even smaller and are measured in micrograms ($1/_{1,000,000}$ of a gram). You can find out much more about the RDAs, including how they vary for people of different ages, in Chapter 4.

What's an essential nutrient?

A reasonable person may assume that an essential nutrient is one you need to sustain a healthy body. But who says a reasonable person thinks like a nutritionist? In nutritionspeak, an *essential nutrient* is a very special thing:

- **An essential nutrient cannot be manufactured in the body.** You have to get essential nutrients from food or from a nutritional supplement.
- **An essential nutrient is linked to a specific deficiency disease.** For example, people who go without protein for extended periods of time develop the protein-deficiency disease *kwashiorkor.* People who do not get enough vitamin C develop the vitamin C–deficiency disease *scurvy.* A diet rich in the essential nutrient cures the deficiency disease, but you need the proper nutrient. In other words, you can't cure a protein deficiency with extra amounts of vitamin C.
- **Not all nutrients are essential for all species of animals.** For example, vitamin C is an essential nutrient for human beings, but not for dogs. A dog's body makes the vitamin C it needs. Check out the list of nutrients on a can or bag of dog food. See? No C. The dog already has the C it — sorry, he or she — requires.

Essential nutrients for human beings include many well-known vitamins and minerals, several *amino acids* (the so-called building blocks of proteins), and at least two fatty acids. For more about these essential nutrients see Chapters 6, 7, 10, and 11.

Other interesting substances in food

The latest flash in the nutrition sky is caused by phytochemicals. *Phyto* is the Greek word for plants, so *phytochemicals* are simply — yes, you've got it — chemicals from plants. Although the 13-letter group name may be new to you, you're already familiar with some phytochemicals. Vitamins are phytochemicals. Colors such as beta carotene, a deep yellow pigment in fruits and vegetables that your body can convert to a form of vitamin A, are phytochemicals. And then there are phytoestrogens, hormonelike chemicals that grabbed the spotlight when it was suggested that a diet high in phytoestrogens, such as the isoflavones found in soybeans, may lower the risk of heart disease and reduce the incidence of reproductive cancers (cancers of the breast, ovary, uterus, and prostate). More recent studies suggest that phytoestrogens may have some problems of their own, so to find out more about phytochemicals, including phytoestrogens, check out Chapter 12.

You are what you eat

Oh boy, I bet you've heard this one before. But it bears repeating because the human body really is built from the nutrients it gets from food: water, protein, fat, carbohydrates, vitamins, and minerals. On average, when you step on the scale

- About 60 percent of your weight is water.
- About 20 percent of your weight is fat.
- About 20 percent of your weight is a combination of mostly protein (mostly in your muscles) plus carbohydrates, minerals, and vitamins.

An easy way to remember this formula is to think of it as the "60-20-20 Rule."

Your nutritional status

Nutritional status is a phrase used to describe the state of your health related to your diet. For example, people who are starving do not get the nutrients or calories they need for optimum health. These people are said to be *malnourished* (mal = bad), which means their nutritional status is, to put it gently, definitely not good. Malnutrition may arise from

- **A diet that does not provide enough food.** This situation may occur in times of famine or through voluntary starvation because of an eating disorder or because something in your life disturbs your appetite. For example, older people may be at risk of malnutrition because of tooth loss or age-related loss of appetite or because many live alone and sometimes just forget to eat.
- **A diet that, while otherwise adequate, is deficient in a specific nutrient, such as vitamin C.**
- **A metabolic disorder that prevents your body from absorbing specific nutrients, such as protein or carbohydrates.**
- **A medical condition that prevents your body from using nutrients.** For example, people who abuse alcohol are often malnourished because alcohol depresses appetite and interferes with the body's ability to metabolize the nutrients it does get.

Doctors have many tools with which to rate your nutritional status. Your doctor can

- Review your medical history to see whether you have any conditions (such as dentures) that may make it hard for you to eat certain foods or that interfere with your ability to absorb nutrients.
- Perform a physical examination to look for obvious signs of nutritional deficiency such as dull hair and eyes (a lack of vitamins?), poor posture (not enough calcium to protect the spinal bones?), or extreme thinness (not enough food? an underlying disease?).
- Order laboratory blood and urine tests that may identify early signs of malnutrition, such as the lack of red blood cells that characterizes anemia caused by an iron deficiency.

At every stage of life, the aim of a good diet is to maintain a healthy nutritional status.

Finding Nutrition Facts

Getting reliable information about nutrition can be a daunting challenge. For the most part, your nutrition information is likely to come from TV and radio talk shows or news, your daily newspaper, your favorite magazine, a variety of nutrition-oriented books, and the Internet. How can you tell whether what you hear or read is really right?

Nutritional people

The people who make nutrition news may be scientists, reporters, or simply someone who wandered in with a new theory (Artichokes prevent cancer! Never eat cherries and cheese at the same meal! Vitamin C gives you hives!), the more bizarre the better. But several groups of people are most likely to give you news you can use with confidence. For example:

- **Nutrition scientists:** These are people with graduate degrees (usually in chemistry, biology, biochemistry, or physics) engaged in research dealing primarily with the effects of food on animals and human beings.
- **Nutrition researchers:** These may be either nutrition scientists or professionals in another field such as medicine or sociology whose research (study or studies) concentrates on the effects of food.
- **Nutritionists:** These are people who concentrate on the study of nutrition. In some states, a person who uses the title “nutritionist” must have a graduate degree in basic science courses related to nutrition.
- **Dietitians:** These people have undergraduate degrees in food and nutrition science or the management of food programs. A person with the letters RD after his or her name has completed a dietetic internship and passed an American Dietetic Association licensing exam.
- **Nutrition reporters and writers:** These are people who specialize in giving you information about the medical and/or scientific aspects of food. Like reporters who concentrate on politics or sports, nutrition reporters gain their expertise through years of covering their beat. Most have the science background required to make it possible for them to translate technical information into language nonscientists can understand; some have been trained as dietitians, nutritionists, or nutrition scientists.

What's a body made of?

Sugar and spice and everything nice . . . Oops. What I meant to say was the human body is made of water and fat and protein and carbohydrates and vitamins and minerals.

On average, when you step on the scale, approximately 60 percent of your weight is water, 20 percent is body fat (slightly less for a man), and 20 percent is a combination of mostly protein, plus carbohydrates, minerals, vitamins, and other naturally occurring biochemicals.

Based on these percentages, you can reasonably expect that an average 140-pound person's body weight consists of about

- 84 pounds of water
- 28 pounds of body fat
- 28 pounds of a combination of protein (up to 25 pounds), minerals (up to 7 pounds), carbohydrates (up to 1.4 pounds), and vitamins (a trace).

Yep, you're right: Those last figures do total more than 28 pounds. That's because "up to" (as in "up to 25 pounds of protein") means that the amounts may vary from person to person.

For example, a young person's body has proportionately more muscle and less fat than an older person's, while a woman's body has proportionately less muscle and more fat than a man's. As a result, more of a man's weight comes from protein and calcium, while more of a woman's body comes from fat. Protein-packed muscles and mineral-packed bones are denser tissue than fat.

Weigh a man and a woman of roughly the same height and size, and he is likely to tip the scale higher every time.

Recommended Dietary Allowances (Washington D.C.: National Academy Press, 1989); Eleanor Noss Whitney, Corinne Balog Cataldo, and Sharon Rady Rolfes, *Understanding Normal and Clinical Nutrition* (Minneapolis/St. Paul: West Publishing Company, 1994)

Consumer alert: Regardless of the source, nutrition news should always pass what you may call *The Reasonableness Test.* In other words, if a story, or report, or study sounds ridiculous, it probably is.

Want some guidelines for evaluating nutrition studies? Read on.

Can you trust this study?

You open your morning newspaper or turn on the evening news and read or hear that a group of researchers at an impeccably prestigious scientific organization has published a study showing that yet another thing you've always taken for granted is hazardous to your health. For example:

- Drinking coffee stresses your heart.
- Adding salt to food raises blood pressure.
- Fatty foods increase your risk of cancer or heart disease.

So you throw out the offending food or drink or rearrange your daily routine to avoid the once-acceptable, now-dangerous food, beverage, or additive. And then what happens? Two weeks, two months, or two years down the road, a second, equally prestigious group of scientists publishes a second study conclusively proving that the first group got it wrong: In fact, coffee has no effect on the risk of heart disease — and may even improve athletic performance. Salt does not cause hypertension except in certain sensitive individuals. Only *some* fatty foods are risky.

Who's right? Nobody seems to know. That leaves you, a layperson, on your own to come up with the answer. Never fear — you may not be a nutritionist, but that doesn't mean you can't apply a few common-sense rules to any study you read about, rules that say: "Yes, this may be true," or "No, this isn't."

Does this study include human beings?

True, animal studies can alert researchers to potential problems, but working with animals alone cannot give you conclusive proof.

Different species react differently to various chemicals and diseases. Although outright poisons such as cyanide clearly traumatize any living body, many foods or drugs that harm a laboratory rat won't harm you. And vice versa. For example, mouse and rat embryos suffer no ill effects when their mothers are given thalidomide, the sedative that's known to cause deformed fetal limbs when given to pregnant monkeys — and human beings at the point in pregnancy when limbs are developing.

Are enough people in this study?

Hey, researchers saying, "Well, I did give this to a couple of people," is simply not enough. The study must include sufficient numbers and a variety of individuals, too. If you don't have enough people in the study — several hundred to many thousand — to establish a pattern, there's always the possibility that an effect occurred by chance. If you don't include different types of people, which generally means young and old men and women of different racial and ethnic groups, your results may not apply across the board. For example, the original studies linking high blood levels of cholesterol to an increased risk of heart disease and small doses of aspirin to a reduced risk of a second heart attack were done only with men. It wasn't until follow-up studies were conducted with women that researchers were able to say with any certainty that high cholesterol is dangerous and aspirin is protective for women as well as men.

Is there anything in the design or method of this study that might affect the accuracy of its conclusions?

For example, a retrospective study (which asks people to tell what they did in the past) is always considered less accurate than a prospective study (one that follows people while they're actually doing what the researchers are studying), because memory isn't always accurate. People tend to forget details or, without meaning to, alter them to fit the researchers' questions.

Are the study's conclusions reasonable?

When a study comes up with a conclusion that seems illogical to you, chances are the researchers feel the same way. For example, in 1990, the long-running Nurses' Study at the Harvard School of Public Health reported that a high-fat diet raised the risk of colon cancer. But the data showed a link only to diets high in beef. No link was found to diets high in dairy fat. In short, this study was begging for a second study to confirm (or deny) its results. The same is true of a later study suggesting that eating dietary fiber didn't reduce the risk of colon cancer. ***Memo to the researchers:*** Hey, guys! We're still waiting!