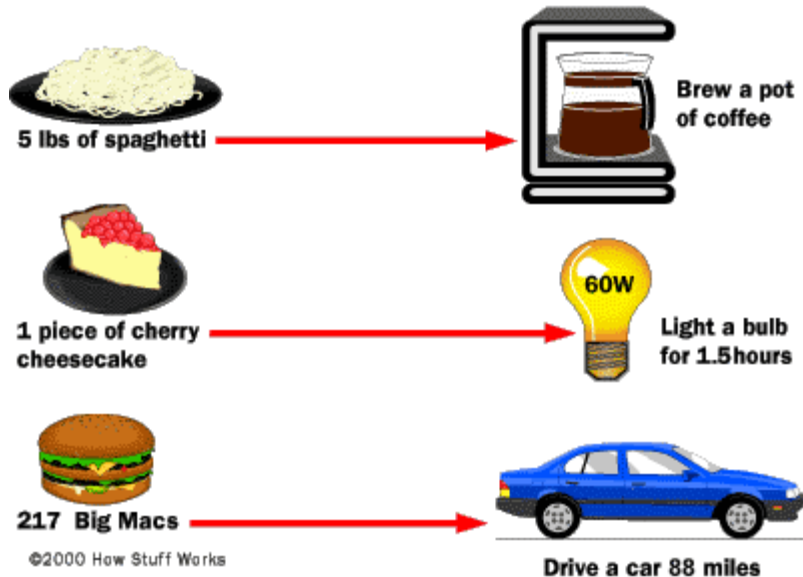


# How Calories Work

by [Julia Layton](#)

For years now, calories have been all the rage -- people are counting them and cutting them, and you'd be hard-pressed to find something at the supermarket that does not list its calories per serving somewhere on the package. But have you ever wondered what exactly a calorie is?

## The Calories in these items could:



In this edition of [HowStuffWorks](#), we'll find out what calories are and why we need them, and examine the relationship between calories and weight.

## What is a Calorie?

A calorie is a unit of [energy](#). We tend to associate calories with food, but they apply to anything containing energy. For example, a gallon (about 4 liters) of gasoline contains about 31,000,000 calories.

Specifically, a calorie is the amount of energy, or **heat**, it takes to raise the temperature of 1 gram of water 1 degree Celsius (1.8 degrees Fahrenheit). One calorie is equal to 4.184 joules, a common unit of energy used in the physical sciences.

Most of us think of calories in relation to [food](#), as in "This can of soda has 200 calories." It turns out that the calories on a food package are actually **kilocalories** (1,000 calories = 1 kilocalorie). The word is sometimes capitalized to show the difference, but usually not. A food calorie contains 4,184 joules. A can of soda containing 200 food calories contains 200,000 regular calories, or 200 kilocalories. A gallon of gasoline contains 31,000 kilocalories.

The same applies to exercise -- when a fitness chart says you burn about 100 calories for every mile you jog, it means 100 kilocalories. **For the duration of this article, when we say "calorie," we mean "kilocalorie."**

## What Calories Do

Human beings need energy to survive -- to [breathe](#), move, pump [blood](#) -- and they acquire this energy from food.

The number of calories in a food is a measure of how much [potential energy](#) that food possesses. A gram of [carbohydrates](#) has 4 calories, a gram of [protein](#) has 4 calories, and a gram of [fat](#) has 9 calories. Foods are a compilation of these three building blocks. So if you know how many carbohydrates, fats and proteins are in any given food, you know how many calories, or how much energy, that food contains.

### Caloric Breakdown

- 1 g Carbohydrates: 4 calories
- 1 g Protein: 4 calories
- 1 g Fat: 9 calories

If we look at the nutritional label on the back of a packet of maple-and-brown-sugar oatmeal, we find that it has 160 calories. This means that if we were to pour this oatmeal into a dish, set the oatmeal on fire and get it to burn completely (which is actually pretty tricky), the reaction would produce 160 kilocalories (remember: food calories are kilocalories) -- enough energy to raise the temperature of 160 kilograms of water 1 degree Celsius. If we look closer at the nutritional label, we see that our oatmeal has 2 grams of fat, 4 grams of protein and 32 grams of carbohydrates, producing a total of 162 calories (apparently, food manufacturers like to round down). Of these 162 calories, 18 come from fat (9 cal x 2 g), 16 come from protein (4 cal x 4 g) and 128 come from carbohydrates (4 cal x 32 g).

Our [bodies](#) "burn" the calories in the oatmeal through metabolic processes, by which [enzymes](#) break the carbohydrates into glucose and other sugars, the fats into glycerol and fatty acids and the proteins into amino acids (see [How Food Works](#) for details). These molecules are then transported through the bloodstream to the [cells](#), where they are either absorbed for immediate use or sent on to the final stage of metabolism in which they are reacted with oxygen to release their stored energy.

Click [here](#) for a simplified diagram of these metabolic processes.

## Your Caloric Needs

Just how many calories do our [cells](#) need to function well? The number is different for every person. You may notice on the nutritional labels of the foods you buy that the "percent daily values" are based on a 2,000 calorie diet -- 2,000 calories is a rough average of what a person needs to eat in a day, but your body might need more or less than 2,000 calories. Height, weight, gender, age and activity level all affect your caloric needs. There are three main factors involved in calculating how many calories your body needs per day:

- **Basal metabolic rate**
- **Physical activity**
- **Thermic effect of food**

Your **basal metabolic rate** (BMR) is the amount of energy your body needs to function at rest. This accounts for about 60 to 70 percent of calories burned in a day and includes the energy required to keep the [heart](#) beating, the [lungs](#) breathing, the [kidneys](#) functioning and the body temperature stabilized. In general, men have a higher BMR than women. One of the most accurate methods of estimating your basal metabolic rate is the **Harris-Benedict formula**:

- **Adult male:**  $66 + (6.3 \times \text{body weight in lbs.}) + (12.9 \times \text{height in inches}) - (6.8 \times \text{age in years})$
- **Adult female:**  $655 + (4.3 \times \text{weight in lbs.}) + (4.7 \times \text{height in inches}) - (4.7 \times \text{age in years})$

(Note: The first number in the equation for females is, in fact, 655. Strange but true.)

The second factor in the equation, **physical activity**, consumes the next highest number of calories. Physical activity includes everything from making your bed to jogging. Walking, lifting, bending, and just generally moving around burns calories, but the number of calories you burn in any given activity depends on your body weight. [Click here](#) for a great table listing the calories expended in various physical activities and for various weights.

The **thermic effect of food** is the final addition to the number of calories your body burns. This is the amount of energy your body uses to digest the food you eat -- it takes energy to break food down to its basic elements in order to be used by the body. To calculate the number of calories you expend in this process, multiply the total number of calories you eat in a day by 0.10, or 10 percent. If you need some help determining how many calories you eat in a day, check out these sites:

- [Calorie and Vitamin Counter](#)
- [Food Database](#)
- [Fast Food Calorie & Fat Gram Counter](#)

The total number of calories a body needs in a day is the sum of these three calculations. If you only want a rough estimate of your daily caloric needs, you can skip the calculations and click [here](#).

## Calories, Fat and Exercise

So what happens if you take in more or fewer calories than your body burns? You either gain or lose [fat](#), respectively. An accumulation of 3,500 extra calories is stored by your body as 1 pound of fat -- fat is the body's way of saving energy for a rainy day. If, on the other hand, you burn 3,500 more calories than you eat, whether by [exercising](#) more or eating less, your body converts 1 pound of its stored fat into energy to make up for the deficit.

One thing about exercise is that it raises your metabolic rate not only while you're huffing and puffing on the treadmill. Your metabolism takes a while to return to its normal pace. It continues to function at a higher level; your body burns an increased number of calories for about two hours after you've stopped exercising.

Lots of people wonder if it matters where their calories come from. At its most basic, if we eat exactly the number of calories that we burn and if we're only talking about weight, the answer is no -- a calorie is a calorie. A protein calorie is no different from a fat calorie -- they are simply units of energy. As long as you burn what you eat, you will maintain your weight; and as long as you burn more than you eat, you'll lose weight.

But if we're talking [nutrition](#), it definitely matters where those calories originate. Carbohydrates and proteins are healthier sources of calories than fats. Although our bodies do need a certain amount of fat to function properly -- an adequate supply of fat allows your body to absorb the vitamins you ingest -- an excess of fat can have serious health

consequences. The [U.S. Food and Drug Administration](#) recommends that a maximum of 30 percent of our daily calories come from fat. So, if you eat 2,000 calories a day, that's a maximum of 600 calories from fat, or 67 grams of fat, per day. However, many doctors and nutritionists now set the maximum number of fat calories at 25 percent of our daily caloric intake. That's 56 grams of fat per day for a 2,000 calorie diet.

Here are some calorie and fat contents that may surprise you:

Food	Serving Size	Calories	Fat Grams
Canola oil	1 cup	1,674	218
Peanut butter	1 cup	1,520	129
Cheddar cheese	1 cup	531	44
Granola	1 cup	270	8
Chocolate syrup	1 cup	837	3
Sugar	1 cup	774	0
Coca-Cola	1 can	140	0

For more information on calories, dieting, nutrition and related topics, check out the links on the next page!

## Lots More Information!

### Related HowStuffWorks Articles

- [How Food Works](#)
- [How Fats Work](#)
- [How Fat Cells Work](#)
- [How Exercise Works](#)
- [How Dieting Works](#)
- [Does drinking ice water burn calories?](#)
- [How many calories does a person need daily?](#)

### More Great Links

- [Nutrition Calculators](#)
- [Calorie and Vitamin Counter](#)
- [CaloriesPerHour.com](#)
- [Food Database](#)
- [Fast Food Calorie & Fat Gram Counter](#)
- [Food For Thought: An Interview with Nutrition Scientist Dr. Paul Saltman](#)
- [What a Set of Batteries!: A Commentary on the Origin and Use of Our Body's Energy](#)
- [Experiment: Measuring the Number of Calories in Sunlight](#) - PDF
- [Calories: The Currency of All Economies](#)
- [Daily Calories per Capita by Geographic Region](#)