

# Is a Calorie Always a Calorie?

*By ACSH Staff — January 1, 1991*

Every now and then someone says, "Calories do not count. Some foods are more fattening than others." This statement is not quite correct, calories do count. However, recent scientific evidence suggests that the calories from some foods are more fattening than from others. How can this be? Let's take a look at the calorie content of different foods, and how these calories are used in our body.

The major calorie-containing foods, protein, carbohydrates, and fats are oxidized (or burned) in our body to produce energy. Proteins and carbohydrates each contribute four calories per gram, and fat contributes nine calories per gram to our energy needs. Fat, therefore, provides about 2.25 times as many calories as does protein and carbohydrate. For this reason alone, fat in equal amounts would be more fattening than the other two major energy foods. However, it appears that, under certain physiological conditions, even on a calorie per calorie basis, fat is slightly more efficient in promoting weight gain.

## **Energy Value of Foods Under Normal Conditions**

If a person is in energy balance and overall nutrient balance, calories whether coming from fat, carbohydrates, or protein, count equally. One fat calorie equals one protein calorie or one carbohydrate calorie.

The situation seems to change slightly when a person is not in energy balance, but gains weight. Weight gain represents a situation in which new tissue is being formed when the body becomes larger, during growth, or when new fat deposits are being laid down in adipose tissue.

## **Energy Value of Foods During Growth and Weight Gain**

Over forty years ago, it was observed that when the fat content of a test diet in growing rats was increased, at the expense of protein and carbohydrate, the rats gained more weight than in the control diets, everything else and calorie count being equal. These studies suggested that the actual caloric value of fat under these conditions might be greater than the conventional value of nine kilocalories per gram.

Recently, similar results were observed when vegetable shortening calories were compared to the standard protein or carbohydrate calories. Again, fat seemed to be more efficient in promoting weight gain than carbohydrates. The physiological caloric value of fat was higher than nine calorie/gm by 123%.

As it turns out, fat does not really have more calories than the nine calories per gram measured under normal conditions. However, when animals are gaining weight during growth or when getting fat, the fat calories seem to be more efficient for creating new tissue than calories coming

from carbohydrates (or protein).

Studies in humans also indicate that fat in the diet appears to be a more potent calorie source for promoting growth or weight gain. Scientific studies have shown that when high fat diets are fed to human beings, particularly when the fat is saturated, fat oxidation is reduced and carbohydrate oxidation is increased. This results in a more efficient deposition of fat calories in fat deposits, while relatively more carbohydrate is oxidized for energy.

Interestingly, polyunsaturated fatty acids are more easily oxidized for energy than saturated fatty acids. In fact, scientists at the University of Pittsburgh demonstrated in 1967 that diets high in polyunsaturated fatty acids lowered serum cholesterol levels by promoting the oxidation of fatty acids, thus diverting the fat from synthesis of blood lipids.

### **Energetics of Weight Loss**

Weight loss occurs when the body's composition is being changed in a different way than in weight gain. Due to lack of food, bodily components are oxidized for energy and the body shrinks. During weight loss the caloric value of fat does not change when compared to carbohydrate. Under these physiological conditions, all food stuffs have their correct and computed energy content.

Weight loss has long been regarded as a simple reduction of the fat content of the body. It must be recognized, however, that changes in body composition taking place during periods of deficient caloric intake are more complex than simple loss of fat.

Usually we estimate weight loss by assuming that one pound of adipose tissue, which is about 85% fat, contains 3,500 calories. Thus, if we eat 7,000 calories less per week, we would lose two pounds. In reality, in the beginning of a weight loss period, we lose four pounds the first week. This is because carbohydrate, protein and water will be mobilized as well as fat. The caloric value of tissue lost during the first week is about 1,700 calories/lb of body tissue loss (7,000 calories divided by 4) instead of 3,500 calories per pound of fat tissue.

As weight reduction continues, however, the situation changes. Now, mostly fat will be burned and the predicted loss of weight will reflect the caloric value of a pound of adipose tissue. For each 3,500 calories less consumed, one pound of fat will be lost. Unfortunately, the body eventually adapts to this new situation and reduces its energy expenditure. Generally, during weight loss, metabolic rate goes down by about 25%, even though the person tries to maintain the same energy requiring activities.

### **Predisposition to Obesity?**

Individuals with strong genetic traits for obesity have a different pattern of fat deposition or mobilization than normal persons. Animals with a genetic trait for obesity have more efficient enzymes in their fat cells for promoting fat deposits. These enzymes are more efficient in converting glucose and other energy sources to body fat. In other persistent types of obesity, certain enzymes (lipoprotein lipase) haul more fat into the cells than they would in normal animals. Studies indicate that humans who are prone to obesity, also oxidize fat less readily and have lower resting metabolic rates than do people who are less prone to obesity. Thus, genetic factors, in addition to the caloric values of food stuffs promote fat deposition and weight gain.

Is a calorie a calorie? Yes, for people who are not overweight but in energy balance, calories equal calories independent of source. But when a person gains weight, dietary fats seem to become more effective in promoting weight gain than, for example, carbohydrates. The fat calories seem to wander more quickly into the fat cells. This is a very good reason for limiting fat in the diet of persons who tend to gain weight.

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