

Eat Less to Live Longer

Why cutting unnecessary calories may add years to your life.

By Jenna A. Bell-Wilson, MS, RD, LD

In an era when everything from sport utility vehicles to hamburgers comes “supersized,” the notion that less is more may seem terribly out-of-date. But when it comes to calories, eating fewer may very well turn out to be a prescription for a longer—and healthier—life.

The topic of calorie restriction has gotten a lot of attention recently in consumer publications and scientific journals alike. However, the theory that eating fewer calories may promote longevity dates back to the 1930s (Heilbronn & Ravussin 2003). Over the years, researchers have found evidence to support the benefit of curbing calorie intake in mice, monkeys, rats, fish, worms, flies—even yeast (Koubova & Guarente 2003). However, the key is to cut calories while still getting the vital nutrients the body needs to thrive.

This article describes the research behind the theory of calorie restriction without undernutrition. In this approach, the number of calories consumed is limited, but intake of protein and essential fats is sufficient to prevent micronutrient deficiencies. You’ll learn about the latest research on the link between body weight and health, the mechanisms behind calorie restriction and longevity, and how clients can apply this “less is more” theory to their daily menus.

Why Bigger Isn't Better

Most fitness professionals know that nearly two-thirds of adults in the United States are overweight and more than 30 percent are obese (National Institute of Diabetes and Digestive and Kidney Diseases 2003). What may come as a surprise is the *alarming rate* at which many people are losing their battle with obesity.

According to a recent report, the number of individuals considered **morbidly** or **severely obese** (defined as having a body mass index [BMI] of 40 or higher, or being 100 or more pounds overweight) rose from 1 in 200 adults in 1986 to 1 in 50 in the year 2000 (Brink 2003)! To make matters even worse, the number of people with a BMI of 50 or greater escalated from 1 in 2,000 to 1 in 400 during this same time period (Brink 2003).

Statistics like this are frightening when you consider the health consequences of being overweight or obese. We now know that there is a laundry list of risk factors associated with obesity which can seriously threaten how long and how well people live.

The Link Between Body Weight & Mortality

The research on whether body weight influences longevity in humans is not conclusive. For example, the results from one study that followed middle-aged men over a 27-year period did show a direct relationship between BMI and mortality; subjects who weighed 20 percent less than the U.S. average for people the same age and height had the lowest mortality rates (Lee et al. 1993). However, other researchers have found higher mortality rates for subjects who are at either extreme of the BMI scale, meaning that anyone who is either significantly underweight or significantly overweight is at increased risk (Gaesser 1998).

Some experts theorize that the fact that overweight subjects are typically sedentary and have diminished cardiorespiratory fitness tends to skew the results of any analysis of body weight and mortality (Gaesser 1998). Other studies suggest that weight loss itself may put people at risk and that those with the greatest variability in body weight are at higher risk for cardiovascular disease and all-cause mortality (Blair et al. 1993). With results as varied as these, it's easy to see that more research is needed before any conclusions can be drawn about the effect of body weight alone on mortality.

Unraveling the Secret to Longevity

Not long ago, *Newsweek* magazine featured a story about the high percentage of **centenarians** (those aged 100 or older) who reside on the island of Okinawa in Japan (Takayama 2003). Researchers were fascinated to learn that, of the island's 1.3 million residents, approximately 600 had reached their 100th birthdays. This startling ratio makes Okinawa home to the highest proportion of centenarians in the world: 39.5 for every 100,000 people, compared to about 10 in 100,000 Americans (Takayama 2003).

Investigations into the Okinawa way of life revealed that most islanders consume a high-quality diet, consisting mainly of home-grown vegetables, tofu and seaweed; they also tend to live low-stress, active lives (Takayama 2003). But what sparked the most

attention is the fact that, while most Okinawans have protein and fat intakes similar to those of their fellow citizens, the Okinawans' calorie levels are 20 percent lower than the Japanese national average (Heilbronn & Ravussin 2003).

Surprisingly, the number of centenarians is increasing even in the United States. At the last American Dietetic Association annual conference, Thomas Perls, MD, author of *Living to 100*, discussed lifestyle choices for living a long and productive life. After studying a group of centenarians in the Boston area, Perls concluded that "the older you get, the healthier you have been." While this may seem enigmatic, he explained that those who reach the age of 100 have succeeded in keeping illness at bay.

Perls reached this conclusion after dividing his subjects into three categories, which he dubbed "survivors, delayers and escapers" (Evert et al. 2003). **Survivors** were those who had been diagnosed with an age-related illness before age 80; **delayers** had been diagnosed with an age-associated illness after age 80; and **escapers** had reached their 100th birthdays without being diagnosed with an age-related illness (Evert et al. 2003). When asked for their secrets to a long life, Perls' subjects cited a host of reasons, from exercising regularly every morning to eating a particular food each day to simply being flat-out lucky!

THE DANGERS OF GETTING TOO FEW CALORIES

Calorie restriction may increase longevity, but it should not be attempted without careful preparation and the help of a registered dietitian. The key to successfully reducing calories is to retain a sufficient amount of micronutrients, protein and essential fat in daily meal planning. Thus, the best way to describe it is calorie restriction without undernutrition.

Clients need to understand that calorie restriction is not a diet in the conventional sense of the word, nor does it involve arbitrarily excluding calories. According to Roy Walford, MD, professor of pathology at UCLA School of Medicine, it should be "undertaken as a change in lifestyle in terms of what one eats, not just to lose weight and look good, but to retard aging, prevent disease and enhance health."

To avoid nutrition deficiencies, it is imperative to consume adequate amounts of protein and essential fats when limiting calories. Healthy protein sources include fish and lean cuts of meat, while unsalted nuts and healthy oils (such as canola and olive) can provide essential fats.

If clients restrict calories without eating adequate nutrients, deficiencies will result similar to those seen in undernourished populations or people with eating disorders. These deficiencies can include an increased incidence of infection and immune depression (Troyer & Fernandes 2000); lack of stature; late reproductive maturation; lower steroid levels in adults; difficulty with lactation in nursing mothers (Heilbronn & Ravussin 2003); and bone density loss and osteoporosis (Troyer & Fernandes 2000).

Longevity & Calorie Restriction

Calorie restriction without undernutrition has been shown to be remarkably beneficial in extending the life span of rodents and several other species (Troyer & Fernandes 2000). Animals placed on low-calorie, optimal diets have shown a slowing of the typical signs of aging, such as a decline in immune function or loss of functional capacity (Roth, Ingram & Lane 1999). This approach has also been found to reduce the risk of kidney disease, autoimmune diseases, neurodegenerative diseases (such as stroke, Parkinson's disease, Alzheimer's disease and Huntington's disease) and diabetes in different experimental animals (Koubova & Guarente 2003).

Unfortunately, research on the effect of calorie restriction in humans has been sparse and sometimes serendipitous. For example, participants in the Biosphere 2 experiment inadvertently provided evidence about the effects of calorie restriction in humans (Walford et al. 1999). Crew members living in the self-contained ecological space outside of Tucson, Arizona, were reduced to eating a low-calorie diet after experiencing unanticipated problems with crop cultivation. Originally slated to eat 2,500 calories per day, the crew actually ended up averaging only 1,800 calories a day for their first 6 months, then switched to about 2,000 calories daily for the remaining 18 months (Walford et al. 1999). At the end of this unplanned diet, the male crew members had lost 18 percent of their body weight while the women had shed 10 percent; most of the weight loss occurred during the first 6 to 9 months.

Although low in calories, the Biosphere diet was "honed to provide optimal nutrition in terms of *all* essential nutrients," according to lead researcher Roy Walford, MD, professor of pathology at the UCLA School of Medicine. The diet comprised approximately 12 percent protein, 11 percent fat and 77 percent carbohydrates and consisted primarily of vegetables, fruits, nuts, grains and legumes, supplemented with modest amounts of dairy, eggs and meat (Walford et al. 2002). At the end of the 2 years, crew members had not only lost weight but also reduced their blood pressure, blood glucose, insulin, total-cholesterol, low-density lipoprotein (LDL) and triglyceride levels, all of which—when elevated—are linked to the development of chronic disease (Walford et al. 2002).

Although the mechanisms by which calorie restriction affects longevity are not completely understood, researchers have theorized that eating fewer calories could be related to decreases in energy metabolism (and resultant oxidative damage); reduced insulin levels; or reduced body fat.

ENERGY METABOLISM & OXIDATIVE DAMAGE

Some experts have attributed the signs and symptoms of aging to cumulative oxidative damage produced during normal energy metabolism and respiration—a process known as **free-radical production** (Koubova & Guarente 2003). It is thought that when calorie consumption is restricted, the body's metabolism, or its "rate of living," declines (Heilbronn & Ravussin 2003). This decrease in normal energy metabolism may lessen oxidative (i.e., free-radical) damage, thereby diminishing the signs and symptoms of aging.

It is true that studies involving rodents have shown declines in

oxidative damage when calories were restricted (Koubova & Guarente 2003). On the other hand, experts are divided as to whether the body reaches a new steady metabolic state during calorie restriction, in which case any health benefit would be reduced (Heilbronn & Ravussin 2003). Nonetheless, there is evidence that calorie restriction can reduce oxidative damage in different species and may enhance the body's defense system (Heilbronn & Ravussin 2003).

INSULIN LEVELS

A relatively new theory on calorie restriction involves the role insulin levels play in regulating cell membrane composition and the growth factors that help with tissue maintenance (Parr 1997). Dis-

HUNGRY HEART, HEALTHY HEART?

The effects of calorie restriction on heart health are the focus of a growing body of scientific research. Weight loss has been found to be effective in reducing blood triglycerides, total cholesterol and LDL levels—all powerful biomarkers in the development of heart disease (Ellis et al. 1987). In addition, calorie restriction reduces some of the inflammation associated with atherosclerosis and heart disease (Heilbronn & Ravussin 2003).

In a recent study involving mice, researchers determined that calorie restriction helped maintain fatty acid metabolism, reduced DNA damage, inhibited genes involved in cell death, blunted immune activity responsible for inflammation and generally diminished the signs associated with an aging heart (Lee et al. 2002).

turbances in these growth factors are associated with the proliferation of the kinds of cells commonly seen with cancer and **atherosclerosis**, or the development of plaque in the arteries. Growth hormone levels tend to diminish with age, as does cell membrane composition, which is vital for proper mental functioning and tissue growth and repair.

Growth hormone levels and cell membrane composition are both indirectly affected by exposure to insulin after a meal is consumed; however, insulin exposure is lowered when calories are restricted. Some scientists have suggested that calorie restriction may help moderate insulin levels over a person's lifetime, thereby decreasing the risk for disease development (Parr 1997; Barzilai & Gabriely 2001).

BODY FAT LEVELS

Excess body fat in humans is associated with insulin resistance, high blood pressure, high total/LDL cholesterol, diabetes and coronary heart disease (Barzilai & Gabriely 2001). Of special concern is **visceral fat**, the type that accumulates around the midsection and is lodged deeply around the organs. Visceral fat tends to increase with age, upping the risk for atherosclerosis and insulin resistance.

In one experiment, researchers surgically removed the visceral fat in rodents and found improvements in the liver's response to insulin, along with a decline in blood insulin levels (Barzilai & Gabriely 2001). In addition, fat cells release certain chemicals called **cytokines**, which can adversely affect fuel utilization, energy expenditure, insulin sensitivity and hormonal balance (Heilbronn & Ravussin 2003).

Some researchers have theorized that reducing body fat through calorie restriction without undernutrition may help improve the insulin response, which, as mentioned earlier, can reduce risk factors for disease.

The Real World

Although the research on calorie restriction is encouraging, nutrition experts caution that reducing calories below what is needed to maintain body weight can be a daunting task for clients.

According to Sara Garner, RD, a weight loss expert in Denver, the general population is exposed to conflicting messages about dieting. She fears that consumers may get more confused than ever if they attempt to restrict calories while also seeking out foods that are nutrient dense. Garner says that, even when clients are committed to improving their health, it is difficult to alter a lifelong habit of loading up on empty calories from sodas and junk food.

So is calorie restriction without undernutrition a realistic goal for your clients?

Some experts express doubt, but they add the caveat that altering one's diet in the right direction may still be helpful. According to Walford, decreasing calorie intake by even a moderate amount (e.g., 100 to 200 calories per day) can provide some of the benefits of a more restrictive approach. He points out that research on limiting calorie intake in rodents shows that "life extension is linearly related to the degree of restriction all the way from a small amount to a large amount."

In light of such findings, creating a caloric deficit through less dramatic dietary restrictions plus physical activity may be a realistic goal for some clients. Although beneficial at any age, moving toward a lighter diet and leaner body can be especially important as our clients grow older. Studies have found that being overweight in middle age (35-45) can cut as much as 3 years off a human's life expectancy (Caruso 2003). Similar results were reached in studies involving mice (Means, Higgins & Fernandez 1993; Pugh, Oberley & Weindruch 1999).

Living Long, Not Large

Here are some practical strategies to reduce unnecessary calories without creating nutrient deficiencies:

- Make nutrient-dense foods, such as fruits, vegetables, beans and legumes, the mainstays of your diet. For an example of a nutrient-rich daily menu, see Walford's "Anti-Aging Meal Plan for a Day," this page.
- Eat meat occasionally but focus on the leaner cuts. Try to include fish as a regular source of protein.
- To enhance insulin sensitivity, increase your intake of healthful omega-3 fatty acids, which are found in fish (e.g., salmon, mackerel and tuna), walnuts, flaxseed and soy. Taking a vitamin E supplement and engaging in vigorous exercise can also improve insulin sensitivity (Parr 1997).

ANTI-AGING MEAL PLAN FOR A DAY

The following is a sample menu from Roy Walford, MD, author of *The Anti-Aging Plan (Four Walls, Eight Windows 1994)* and *Beyond the 120-Year Diet (Four Walls, Eight Windows 2000)*.

BREAKFAST

1 cup (c) fresh orange juice
1 slice mixed-grain bread
omelette made with 2 egg whites and scallions
brewed coffee or tea with 2 tablespoons low-fat milk

LUNCH

1 piece whole-wheat pita bread or
2 slices whole-wheat bread
1 large falafel patty (or 3 small ones)
1/3 medium sliced tomato
2 leaves lettuce
1 teaspoon (tsp) mustard or low-calorie salad dressing
1/2 tsp roasted tahini butter
1 carrot

AFTERNOON SNACK

1 c plain nonfat yogurt
2 Brazil nuts
3 dried figs

DINNER

2 ounces salmon, baked or broiled
1 spear broccoli, steamed or raw
1/2 c tomato or spaghetti sauce (with 5 soaked sun-dried tomatoes and 3 shitake mushrooms, sautéed in a nonstick skillet)
1 c cooked whole-wheat spaghetti

TOTALS

Calories: 1,524
Protein: 82 grams (g)
Total Fat: 37 g
Carbohydrate: 239 g
Fiber: 33 g
Cholesterol: 59 milligrams

Source: Reprinted with permission from Dr. Roy Walford's Web site: <http://www.walford.com/cronmeals1.htm>; retrieved October 21, 2003.

- Avoid foods that are high in trans fatty acids and partially hydrogenated oils, found in margarines and many processed foods (see "Translating Trans Fat," February 2005 *IDEA Health & Fitness Source* for more examples). Minimize consumption of butter, palm and coconut oils, and fried foods.
- Be sure to include some essential fats in your diet. Good sources include unsalted nuts (e.g., pecans, walnuts and almonds) and plant oils, such as canola and olive oils.
- Check food labels for ingredients, serving sizes and fat content, so you know what you are eating.
- When evaluating calorie intake, don't forget the "hidden" calo-

ries found in many beverages and condiments.

- Combine any reduction in calories with an increase in physical activity level to get the best results. But don't overdo it, especially if you are new to exercise. See "The Dangers of Getting Too Few Calories" sidebar.
- Apply some of the strategies Perls recommends in his prescription for longevity, which he dubs "AGEING." Here's how he breaks down the acronym:
 - "A" is for attitude, which he says can affect the aging process either positively or negatively.
 - "G" is for genetics, which plays a large role in longevity.
 - "E" is for exercise, especially weight training, which Perls recommends at least three times per week to increase muscle mass and protect surrounding joints.
 - "I" is for interests, since brain function is stimulated and enhanced by trying new activities.
 - "N" is for nutrition, or eating a lean diet to moderate insulin levels and decrease visceral fat.
 - The final "G" is for "getting rid of" harmful habits, such as cigarette smoking.

The Take-Home Message

Calorie restriction without undernutrition may turn out to be a prescription for a longer and healthier life. But more studies are needed before any conclusions can be drawn.

In the meantime, there are small steps we can recommend for clients interested in making healthy lifestyle choices. Controlling calories by making moderate dietary changes and maintaining a regular exercise program may be the secret to successful aging at any age!

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