HABITS of HEALTH

Calorie Restriction Guide

Our Best Bet for a Longer Life?

In the 1930s, researchers restricted the calorie intake of lab rats by about one-third and found that the animals' life spans increased by nearly 50 percent. These amazing results—the only proven means of extending life—set in motion a flurry of research. The experiment was repeated on worms, fruit flies, other rodents and even Labrador retrievers, all with similar success. We don't yet know for sure that humans enjoy the same benefits, but studies are encouraging (our life spans are just too long for the data to be complete). But as of now, the science of calorie restriction remains the most robust method known for slowing down the aging process.

Mechanisms of Longevity: Recent Research

Hormesis. Hormesis is a biological response in which exposure to a small amount of toxin or other stressor actually creates a positive effect, causing cells to rally in defense. In 2007, Dr. Michael Ristow demonstrated how this slows down cellular aging by restricting glucose metabolism in a type of worm, extending their life spans. By slightly increasing oxidative stress, the worms ultimately increased their resistance to oxidative stress.*

Insulin signaling. Studies show that if we can turn off the insulin pump and keep insulin levels low, we can increase longevity. According to research, the best way to do that is through exercise, a healthy diet, and keeping lean. sir1/sir2 (sirtuin longevity gene). This longevity gene, discovered in baker's yeast cells, has been shown to extend life span by suppressing DNA instability, and may well underlie aspects of the positive effects of calorie restriction. Activated by calorie restriction, the Sir2 enzyme led to a 30 percent life-span extension in yeast. In mammals, the parallel gene is turned on by a calorie-restricted diet, which protects cells from dying under stress. One exciting development from this research is that resveratrol, a potent antioxidant, can turn this gene on, extending the life span of yeast, nematode worms, fruit flies, and mice. Resveratrol has even been shown to extend the life span of vertebrate fish by 59 percent. And where does resveratrol come from? It's found in great concentration in red wine, and likely plays a central role in what's known as the French paradox—a phenomenon whereby the French, despite a diet high in saturated fat, enjoy low rates of coronary heart disease.

IGF-I (insulin-like growth factor). Evidence has connected reduced exposure to Igf-I with extended life span in rodents. In humans, elevated Igf-I levels have been linked to a number of age-related diseases that limit longevity, such as cancer. But reduced Igf-I activity has been linked to an increased risk of other diseases, including diabetes and cardiovascular disease. It's complex, and probably dependent on other factors we've yet to uncover, but clearly IGF-I does play a role in modulating diseases of aging.

One attractive hypothesis is that longevity could be maximized by regulating IGF-I levels carefully at various stages of life—perhaps through lower levels during early adulthood and higher levels as we grow older.

Decreased levels of circulating triiodothyronine (T3) and the sympathetic nervous system[PB1]. Turning down thyroid production turns down our metabolic machinery, reducing the workload for our cells. A resulting decrease in core temperature and BMR means a decrease in mitochondrial production of oxygen radicals. Turning down the sympathetic nervous system decreases stress chemistry as well.

Decreased levels of inflammatory molecules. Calorie restriction can reduce systemic (body-wide) inflammation, protecting us from the deterioration of the immune system that comes with aging.

Decrease degradation of DNA. Calorie restriction may enhance DNA repair, increase the removal of damaged DNA, and lessen the degradation of telomeres.

Free radical and glycation. When lots of energy is available, mitochondria don't operate as efficiently. That means greater production of dangerous oxygen radicals. With calorie restriction, energy is conserved and fewer free radicals are created. And because an organism practicing calorie restriction is leaner, less energy is needed to support its weight, which means less glucose in the bloodstream. Less glucose means there's less sugar to bind with fats and proteins, and that means there's less risk of atherosclerosis. It's also important to decrease beta-amyloid, which interferes with brain function.

Calorie restriction with optimal nutrition. This is lowering your total number of calories not just by eating less food, but by eating nutritionally dense foods so that there's a higher ratio of nutrients to calories—a process that may lead to more ideal and beneficial nutrient levels in the body. Among the benefits are that many of these nutrients serve as protective antioxidants, and there are likely to be more antioxidants in the body, since lower food intake means lower levels of free radicals.

*Schultz, T., et al., "glucose Restriction extends Caenorhabditis elegans life Span by Inducing Mitochondrial Respiration and Increasing oxidative Stress," Cell Metabolism 6 (4): 280–93.