

Study finds calorie restriction lowers some risk factors for age-related diseases

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A National Institutes of Health-supported study provides some of the first clues about the impact of sustained calorie restriction in adults. Results from a two-year clinical trial show calorie restriction in normal-weight and moderately overweight people did not have some metabolic effects found in laboratory animal studies. However, the researchers

found calorie restriction modified risk factors for age-related diseases and influenced indicators associated with longer life span, such as blood pressure, cholesterol, and insulin resistance. The study was reported in the September, 2015 issue of *Journal of Gerontology: Medical Sciences*.

Calorie restriction is a reduction in [calorie intake](#) without deprivation of essential nutrients. It has been shown to increase longevity and delay the progression of a number of age-related diseases in multiple animal studies. Called Comprehensive Assessment of Long-term Effects of Reducing Intake of Energy (CALERIE), the randomized trial was funded by the National Institute on Aging (NIA) and the National Institute of Diabetes and Digestive and Kidney Diseases, both part of NIH. It was conducted at Washington University in St. Louis, Louisiana State University's Pennington Biomedical Research Institute in Baton Rouge, and Tufts University in Boston. The study coordinating center was at Duke University in Durham, North Carolina.

CALERIE was designed to test the effects of [calorie restriction](#) on resting metabolic rate (after adjusting for [weight loss](#)) and body temperature, which are diminished in many laboratory animal studies and have been proposed to contribute to its effects on longevity.

"The study found that this calorie restriction intervention did not produce significant effects on the pre-specified primary metabolic endpoints, but it did modify several [risk factors](#) for age-related diseases. It is encouraging to find positive effects when we test interventions that might affect diseases and declines associated with advancing age," notes NIA Director Richard J. Hodes, M.D. "However, we need to learn much more about the health consequences of this type of intervention in healthy people before considering dietary recommendations. In the meantime, we do know that exercise and maintaining a healthy weight and diet can contribute to healthy aging."

In laboratory animals, calorie restriction's favorable effects on [life span](#) have generally been found when it is begun in youth or early middle age. An equivalent trial in people would take decades. However, shorter trials can determine feasibility, safety and effects on quality of life, disease risk factors, predictors of life span and effects on mechanisms influenced by calorie restriction in laboratory animal studies. CALERIE was a two-year randomized controlled trial in 218 young and middle-aged healthy normal-weight and moderately overweight men and women to measure these outcomes in a calorie restriction group, compared with a control group who maintained their regular diets.

The calorie restriction participants were given weight targets of 15.5 percent weight loss in the first year, followed by weight stability over the second year. This target was the weight loss expected to be achieved by reducing calorie intake by 25 percent below one's regular intake at the start of the study. The calorie restriction group lost an average of 10 percent of their body weight in the first year, and maintained this weight over the second year. Though weight loss fell short of the target, it is the largest sustained weight loss reported in any dietary trial in non-obese people. The participants achieved substantially less calorie restriction (12 percent) than the trial's 25-percent goal, but maintained calorie restriction over the entire two-year period. The control group's weight and calorie intake were stable over the period. The study found a temporary effect on resting metabolic rate, which was not significant at the end of the study, and no [effect](#) on body temperature.

Although the expected metabolic effects were not found, calorie restriction significantly lowered several predictors of cardiovascular disease compared to the control group, decreasing average blood pressure by 4 percent and total cholesterol by 6 percent. Levels of HDL ("good") cholesterol were increased. Calorie restriction caused a 47-percent reduction in levels of C-reactive protein, an inflammatory factor linked to cardiovascular disease. It also markedly decreased

insulin resistance, which is an indicator of diabetes risk. T3, a marker of thyroid hormone activity, decreased in the calorie restriction group by more than 20 percent, while remaining within the normal range. This is of interest since some studies suggest that lower thyroid activity may be associated with longer life span.

The study also assessed calorie restriction's effects on mood (particularly hunger-related symptoms) and found no adverse effects. No increased risk of serious adverse clinical events was reported. However, a few participants developed transient anemia and greater-than-expected decreases in bone density given their degree of weight loss, reinforcing the importance of clinical monitoring during calorie restriction.

"The CALERIE results are quite intriguing. They show that this degree of sustained calorie restriction can influence disease risk factors and possible predictors of longevity in healthy, non-obese people. It will be important to learn how calorie restriction at this level affects these factors despite the lack of the predicted metabolic effects," said Evan Hadley, M.D, director of NIA's Division of Geriatrics and Clinical Gerontology and an author of the paper. "Since this group already had low risk factor levels at the start of the study, it's important to find out whether these further reductions would yield additional long-term benefits. It also would be useful to discover if calorie restriction over longer periods has additional effects on predictors of health in old age, and compare its effects with exercise-induced weight loss."

More information: Ravussin, E., et al., A 2-Year Randomized Controlled Trial of Human Caloric Restriction: Feasibility and Effects on Predictors of Health Span and Longevity. *J Gerontol A Biol Sci Med Sci* (2015) 70 (9): 1097-1104. [DOI: 10.1093/gerona/glv057](https://doi.org/10.1093/gerona/glv057)

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