



## NIH NEWS ADVISORY

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NATIONAL INSTITUTES OF HEALTH

[National Institute on Aging](#)

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### Three Physiological Measures Linked To Longevity in Men

Three physiological measures associated with long-term caloric restriction in monkeys have been linked to longevity in men, according to scientists at the National Institute on Aging (NIA). It is the first finding to suggest a relationship between well-established biomarkers of caloric restriction in animals and extended longevity in humans who apparently do not stringently limit their caloric intake. The short correspondence appears in the August 2, 2002 issue of the journal *Science*.

The NIA investigators compared more than 700 healthy men\*, ages 19 to 95, who participated in the Baltimore Longitudinal Study of Aging (BLSA) with 60 rhesus monkeys, ages 5 to 25. The men were divided into two groups, based on whether they were in the upper or lower halves of the population for each of the three biomarkers — body temperature, blood insulin levels, and blood levels of dehydroepiandrosterone sulfate (DHEAS). The monkeys also were divided into two groups. One group was allowed to feed freely, typically consuming between 500 to 1,000 calories daily. A second group was fed a diet composed of at least 30 percent fewer calories than consumed by the unrestricted monkeys.

In previous work, calorically restricted mice and rats, which can live up to 40 percent longer than usual, have consistently had lower body temperatures and blood insulin levels than their freely fed counterparts. These two biomarkers also have been found in calorically restricted monkeys. Caloric restriction also slows the decline of DHEAS, a steroid hormone that diminishes in monkeys and humans during normal aging. These three biomarkers suggest that caloric restriction causes metabolic shifts that may affect the rate of aging, said George Roth, Ph.D., senior guest scientist at the NIA and lead author of the new study.

After analyzing the age-adjusted data, the NIA investigators concluded that among men who participated in the BLSA, those who had lower body temperatures, had lower blood insulin levels or had higher blood levels of DHEAS as they aged tended to live longer. The calorically restricted monkeys showed a similar trend, and had half the death rate of monkeys allowed to feed freely. But this mortality data isn't yet statistically significant because few of the primates in either group have died, Dr. Roth said. However, none of the men,

who reported consuming an average of 2,300 calories daily, is believed to have been on a calorically restricted diet.

"The fact that these men apparently weren't practicing caloric restriction is important because it means there may be other ways to achieve biological hallmarks without having to undergo drastic dietary changes," Dr. Roth said. "Although we don't yet know what these pathways are, this finding suggests it may be possible to develop compounds that offer the benefits of caloric restriction without having to resort to it."

Biomarker and mortality data were collected on the men over a 25-year period, and biomarker data were gathered on the monkeys for five years beginning in 1987. Deaths among the monkeys have been tracked for more than 15 years. Biomarkers are indicators or measures of change in biological function of an organism. Gerontologists have long sought to find biomarkers of aging and longevity in humans that would help distinguish physiological age from chronological age.

*The National Institute on Aging is a component of the National Institutes of Health, U.S. Department of Health and Human Services.*

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\* For skin temperature, the researchers analyzed data from 718 men; for insulin, 820 men; for DHEAS, 722 men. In the follow-up period, deaths in each group were: Temperature (324); Insulin (199); and DHEAS (192).