Can Calorie Restriction Delay Chronic Disease and Aging?

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With all the fountain of youth promises, is cutting calories to slow the aging process just one more hype? Research suggests it's more than just a trend — with studies finding first in animals, and now in humans, the potential for the reduction of chronic inflammation and chronic disease as we age by restricting calories. This article explores the science behind the hype, as well as the potential benefits and drawbacks of cutting calories.

Key takeaways:

- Animal studies since 1935 have indicated that when calories are cut, lab animals live longer.
- Aging is not a disease but increases inflammation, the risk of developing chronic diseases, and overall frailty.
- Moderate calorie restriction in human subjects could have the same benefits as found in animal studies, namely a decrease in chronic disease and an increased lifespan.
- The National Institute on Aging will continue to study the promising effects of moderate calorie reduction on chronic inflammation, chronic disease,

- and slowing of the aging process in humans.

Calorie restriction and aging

While not a disease process, aging creates a significant risk of developing inflammation, chronic disease, and frailty. Although the exact mechanism has not been isolated, researchers are looking at the geroscience involved in aging, drilling down to the genetic, molecular, and cellular factors involved. The National Institute on Aging is funding more calorie restriction studies focusing on genetic, molecular, and cellular responses to decreasing our calories as we age.

So far, calorie restriction has been shown to improve the following health outcomes:

- Improved memory
- Improved cognition
- Reduced inflammation
- Lower mortality rates from heart disease and cancer
- Longer lifespan
- Reduced risk of cardiovascular disease and hypertension

Science-backed benefits of calorie restriction

Calorie restriction and aging have been areas of interest since 1935. Researchers at Cornell University over 85 years ago noted that lab rodents lived up to 33% longer when fed fewer calories. Since this early study, interest in calorie reduction and its effect on life span has only increased.

Protection from chronic disease

One review of the effects of caloric restriction on aging concludes that caloric restriction has beneficial effects not only on longevity in humans, but also protects against the development of cancer and certain chronic diseases like cardiovascular disease and hypertension. The reviewers cited evidence of those living in Okinawa, Japan who eat fewer calories than those who live on the mainland of Japan and have very low mortality rates from heart disease or cancer.

Improved memory

A study of 50 normal to overweight females with a mean age of 60.5 years was conducted in Germany over a 3-month period with one group adhering to a 30% calorie restriction, one group increasing unsaturated fat consumption by 20% with calorie reduction, and a control group making no changes in their diets. It was found that calorie restriction resulted in much improved verbal memory scores. This was attributed to decreased plasma levels of insulin and elevated sensitive C-reactive protein, an indicator of inflammation.

Aging & calorie restriction: What's the link?

What is the evidence that calorie restriction can improve your longevity? Looking at the cellular level, there is evidence that calorie restriction impacts your immune system.

The thymus gland, part of the immune system, shrinks with age. More importantly, the thymus gland decreases its production of T cells as it shrinks, which decreases your body's ability to fight infections and potentially cancer cells. Some studies in animals and humans have shown that after significant caloric restrictions, the thymus gland has increased in some subjects, and showed evidence of new T cell production.

In addition, researchers found that with calorie restriction, a gene (PLA2G7) was suppressed in immune cells, which may also result in an improvement in thymus gland function. When researchers decreased PLA2G7 in lab mice, they found the mice to have less fat mass and lower levels of inflammation producing substances. What does this mean with respect to the conditions that occur as we age?

Given the data from studies on humans and mice, there is evidence that calorie restriction, which suppresses PLA2G7 gene production, may improve the immune system and decrease inflammation in humans. This decreases your likelihood of developing chronic disease and potentially increases your lifespan.

Reducing calories, while maintaining sufficient levels of essential nutrients is a difficult balancing act. However, it has been asserted that caloric restriction can increase the human lifespan by 1 to 5 years. There is no agreement as to what percentage of calories should be restricted.

The challenges with calorie restriction

While the recent and emerging research suggests many possible benefits to calorie restriction for longevity, there are some drawbacks to consider:

- **Restriction amount.** In general, more than a moderate restriction is required, but there must be sufficient calories to remain nourished. The ideal number of calories to restrict has not been determined as more research is needed.
- **Foods to avoid.** There is also no consensus on the type of food groups that should be restricted.
- **Personal variations.** Calorie and food group restriction may need to be varied based upon age group and health status.
- **Potential malnutrition.** Researchers recognize that one of the challenges with calorie restriction is being able to stick with a significant cut in calories without triggering malnutrition.
- **Lack of compliance.** It can be difficult to restrict calories and still remain satiated.

People are more likely to stop a calorie restricted program if they feel hungry and undernourished. Researchers are working on developing trials where calorie restriction may be more appealing, possibly in the form of intermittent fasting.

The data from current studies is promising, however, we may be a decade or more away from being able to use calorie restriction to slow or stop the effects of the aging process. Researchers must do long-term follow-up studies on participants in calorie restriction trials to gather more information on the genetic, molecular and cellular response to moderate calorie restriction as we age.

Resources:

1. The effect of retarded growth upon the length of life span and upon the ultimate body size. 1935.
2. Calorie restriction and aging in humans.
3. Caloric restriction in humans reveals immunometabolic regulators of health span.
4. The effects of calorie restriction on aging: A brief review.
5. Calorie restriction improves memory in elderly humans.
6. Calorie restriction trial reveals key factors in extending human health.
