

Telomeres, the protective end-caps on our chromosomes, and telomerase, the enzyme which helps to build up those end-caps, are important to prevent chromosomal damage and degradation and have been proposed as a marker of “biological aging.” Studies have related shorter telomeres to higher risk of some age-related chronic diseases and higher mortality in general, and since their discovery there has been a flurry of research to understand their function and what factors contribute to their activity.

Chronic inflammation and chronic physical and psychological stress have been among the factors that may contribute to telomere shortening and may be part of the reason why those with unhealthy lifestyles (smoking, obesity, physical inactivity) have relatively shortened telomeres. Recent studies have shown improvements in telomerase activity with physical activity and meditation. Currently there is limited data on the influence of herbs and nutrients on telomere length and telomerase activity, however, several studies have indicated that mechanisms that can modulate chronic inflammation and oxidative stress (antioxidant-rich foods, vital nutrients, and traditional herbal medicines) affect telomere length. Below are some of the findings.

- In an epidemiological study of healthy sisters of breast cancer patients, use of **multivitamins** in general was associated with longer telomere length. This same study found that **vitamin B-12** supplement users had longer telomere length than did nonusers. Although micronutrient intake from foods (as measured by food-frequency questionnaires) was generally not related to telomere length in this study, higher dietary response manner even after adjustment for multivitamin use. Among women who did not use multivitamins, higher **dietary intakes of beta-carotene, folate, magnesium, and vitamins C, E, and A** were each associated with longer telomere length. While consuming nutrient-rich foods and vitamins may play a role, individuals who do these things are also more likely to follow a healthy lifestyle.
- Adequate micronutrients such as **niacin, selenium**, vitamin B12, and folate are needed for genomic stability including proper functioning of telomerase. Experimentally, selenium increased telomerase activity
- A separate study found that in women, **vegetable** intake was associated with longer telomere length. And men consuming the lowest amounts of butter and highest amounts of **fruits** had longer telomeres than those consuming the most butter and least fruits. Total fat and saturated fatty acid intake were inversely associated with telomere length in men.
- On the contrary, a study looking at dietary patterns and telomere length found that consumption of processed meats (i.e. hot dogs, lunch meats, sausage, etc) was associated with shortened telomeres. Another study looking at consumption of red and white meat also found an association with shortened telomeres, however the effect was reduced with the presence of **dietary fiber**.
- Related to diet, physical activity and stress level, obesity has been inversely associated with telomere length, and weight loss in obese individuals is associated with increases in telomere length.

- A study of **omega-3** supplementation in healthy sedentary overweight middle-aged or older adults did not show any significant changes in telomere length. However, telomere length increase with decreasing omega-6 to omega-3 plasma fatty acid ratios which are known to affect inflammation.
- Another study looking at dietary intake of certain fatty acids in postmenopausal women found an inverse relationship of telomere length to intake of short-to-medium-chain saturated fatty acids (major sources include: nonskim milk, butter, and whole-milk cheese).
- In two different studies, higher plasma levels of **vitamin D** has been associated with longer telomeres, with the association impacted by calcium intake. A study of Vitamin D supplementation in overweight African Americans did show significant increase in telomerase activity.
- Other measurements of nutrients related to metabolism have also been associated with telomere length including plasma homocysteine (which was associated with shorter telomere length) and plasma folate (which was associated with longer telomere length).
- A study of 2006 elderly Chinese examining food groups and telomere length found that in men, **Chinese tea** consumption was significantly associated with telomere length. In women, intake of fats and oils was borderline and negatively associated with telomere length.
- In mouse models, **Astragalus membranaceus** extract and **purslane** were found to increase telomere length.
- Human cell models have showed increased telomerase activity from **resveratrol**, **ginkgo biloba extract**, and ginsenoside from **ginseng**

The overactivity of telomerase in cancer cells has also been the target of research. In cancer cell research the following have been found to reduce telomerase activity in certain cancer cell lines: ginger extract, curcumin, from turmeric, diosgenin from fenugreek, silibinin from milk thistle, apigenin found in many fruits and vegetables such as parsley, celery and chamomile tea, ganoderma lucidum (Reishi mushroom), cordyceps militaris, phyllanthus urinaria, Atractylis lancea (Chinese herb), Australian bush fruit Illawarra plum. Asian Gleditsia sinensis (Traditional Herbal medicine), Sarcandra glabra (Chinese herb), cucurbitacin B extracted from Trichosanthes cucumerina L (Thai herb), Salvia miltiorrhiza Bunge (traditional herbal medicine).

These studies are just the start of the exploration into factors which can modify telomere length and thus play a role in healthy aging, but likely it will pan out that living a healthy lifestyle and consuming nutrient-rich foods, including superfoods and herbs which have antioxidant and anti-inflammatory properties are an integral part.

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