Multivitamin use and telomere length in women

American Journal of Clinical Nutrition
Vol. 89, No. 6, 1857-1863, June 2009, pp. 1857-1863

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BACKGROUND FROM DAN MURPHY

In 1953, Leonard Hayflick, PhD from the University of California, San Francisco, discovered that human cells divided about 50 times, and then die. This is known as the Hayflick limit. Dr. Hayflick continues to research and publish on human aging and longevity.

About 30 years ago, scientists discovered the reason for the Hayflick limit was telomeres. Telomeres are short caps of DNA on the ends of chromosomes. Each time the cell divides, the telomere shortens a little. When most of the telomere disappears, the cell dies. Consequently, telomere length has been proposed as a marker of biological aging.

FROM ABSTRACT

Background: Telomere length may be a marker of biological aging. Multivitamin supplements represent a major source of micronutrients, which may affect telomere length by modulating oxidative stress and chronic inflammation.

Objective: The objective was to examine whether multivitamin use is associated with longer telomeres in women.

Design: We performed a cross-sectional analysis of data from 586 early participants (age 35–74 y) in the Sister Study. Multivitamin use and nutrient intakes were assessed with a 146-item food-frequency questionnaire, and relative telomere length of leukocyte DNA was measured by quantitative polymerase chain reaction.

Results: After age and other potential confounders were adjusted for, multivitamin use was associated with longer telomeres.

Compared with nonusers, the relative telomere length of leukocyte DNA was on average 5.1% longer among daily multivitamin users.

In the analysis of micronutrients, higher intakes of vitamins C and E from foods were each associated with longer telomeres, even after adjustment for multivitamin use.
Conclusion: This study provides the first epidemiologic evidence that multivitamin use is associated with longer telomere length among women.

THESE AUTHORS ALSO NOTE:

Telomeres exist at the ends of chromosomes.

The length of telomeres decreases with each cell division, which may eventually lead to cell senescence or apoptosis. Therefore, “telomere length has been proposed as a marker of ‘biological aging’.”

“Epidemiologic studies have related shorter telomeres to higher mortality and higher risk of some age-related chronic diseases.”

Oxidative stress and chronic inflammation contribute to the attrition of telomeres, and therefore to increased age-related chronic diseases.

“Several micronutrients, such as antioxidant vitamins and minerals, can modulate the states of oxidative stress and chronic inflammation and therefore may affect telomere length.”

“Multivitamin supplements contain large amounts of many vitamins and minerals and therefore represent a major source of micronutrient intake.”

In this study, “the use of multivitamin supplements was associated with longer telomere length. Compared with nonusers, daily users had on average 5.1% longer telomeres.” This difference corresponds to 9.8 y of age-related telomere loss. [Wow]

Significantly longer telomeres were associated with both the once-a-day and/or the antioxidant combination type of supplement.

Those that took once-a-day type multivitamins for > 5 years increased telomere length by 3%.

Those that took antioxidant combination type multivitamins for > 5 years increased telomere length by 8%. [Wow]

Telomere length was not increased with taking stress-tab or B-complex type of supplements.

Vitamin B-12 supplement users had a 5.9% longer telomere length than did nonusers.

Iron users had a shorter telomere length than nonusers.
“Micronutrient intake from foods was generally not related to telomere length, except for vitamins C and E.”

Among those 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.

DISCUSSION

“In this cross-sectional analysis, multivitamin use was related to longer telomere length in women aged 35–74 y.”

Telomere length has been proposed as a marker of biological aging.

“Because telomere attrition may eventually lead to chromosomal instability and cell death, excessive telomere shortening may play an important role in the development of some chronic diseases.”

Shorter telomeres have been linked to higher mortality, accelerated aging, and higher risk of a variety of chronic diseases.

Oxidative stress is an important contributor to telomere attrition. “Telomeres are particularly vulnerable to oxidative damages, which often cannot be efficiently repaired.”

Inflammmatory reactions induce oxidative stress. [Important]

“Oxidative stress and chronic inflammation may be among the major mechanisms of telomere attrition.” [Important]

“Many micronutrients, such as dietary antioxidants, B-vitamins, and certain minerals, can modulate oxidative stress and inflammatory reactions and therefore can contribute to the maintenance or attrition of telomeres.”

In a prior study, higher plasma vitamin D was associated with longer telomere length, probably via anti-inflammatory actions of vitamin D.

In a prior study, higher plasma homocysteine was associated with shorter telomere length.

In a prior study, higher folate was related to longer telomeres.

“Higher intakes of the antioxidant vitamins C and E consistently showed associations with longer telomeres in different analyses.” “The results are consistent with experimental findings that vitamins C and E protect telomeres in vitro.”
In summary, this study provides evidence linking multivitamin use to longer telomeres. [Key Point]

KEY POINTS FROM DAN MURPHY

1) Telomeres exist at the ends of chromosomes.

2) The length of telomeres decrease with each cell division, which may eventually lead to cell senescence or apoptosis. Therefore, “telomere length has been proposed as a marker of ‘biological aging’.”

3) “Epidemiologic studies have related shorter telomeres to higher mortality and higher risk of some age-related chronic diseases.”

4) Shorter telomeres have been linked to higher mortality, accelerated aging, and higher risk of a variety of chronic diseases.

5) Oxidative stress and chronic inflammation contribute to the attrition of telomeres, and therefore to increased age-related chronic diseases.

6) “Several micronutrients, such as antioxidant vitamins and minerals, can modulate the states of oxidative stress and chronic inflammation and therefore may affect telomere length.”

7) Multivitamin supplements represent a major source of micronutrients, which may affect telomere length by modulating oxidative stress and chronic inflammation.

8) In this study, “the use of multivitamin supplements was associated with longer telomere length. Compared with nonusers, daily users had on average 5.1% longer telomeres.” This difference corresponds to 9.8 y of age-related telomere loss. [Wow]

9) Those that took once-a-day type multivitamins for > 5 years increased telomere length by 3%.

10) Those that took antioxidant combination type multivitamins for > 5 years increased telomere length by 8%. [Wow]

11) Vitamin B-12 supplement users had a 5.9% longer telomere length than did nonusers.

12) Iron users had a shorter telomere length than nonusers.

13) “Micronutrient intake from foods was generally not related to telomere length, except for vitamins C and E.”
14) Oxidative stress is an important contributor to telomere attrition. “Telomeres are particularly vulnerable to oxidative damages, which often cannot be efficiently repaired.”

15) Inflammatory reactions induce oxidative stress. [Important]

16) “Oxidative stress and chronic inflammation may be among the major mechanisms of telomere attrition.” [Important]

17) “Many micronutrients, such as dietary antioxidants, B-vitamins, and certain minerals, can modulate oxidative stress and inflammatory reactions and therefore can contribute to the maintenance or attrition of telomeres.”

18) Higher plasma vitamin D is associated with longer telomere length.

19) Higher plasma homocysteine is associated with shorter telomere length.

20) “Higher intakes of the antioxidant vitamins C and E consistently showed associations with longer telomeres in different analyses.” “The results are consistent with experimental findings that vitamins C and E protect telomeres in vitro.”

21) In summary, this study provides evidence linking multivitamin use to longer telomeres. [Key Point]