Effect of Omega-3 Fatty Acid Levels Shown to be Significant in Telomeric Aging

Review by Dan Murphy, D.C.

TITLE: Association of Marine Omega-3 Fatty Acid Levels with Telomeric Aging in Patients with Coronary Heart Disease

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Notes:
Elizabeth Blackburn, from the Department of Biochemistry and Biophysics, University of California, San Francisco, was awarded the Nobel Prize in Medicine/Physiology, October 2009, for her work pertaining to telomeres.

Background
In 1953, Leonard Hayflick, Ph.D., 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.

Key Points
1) Telomeres are tandem repeat DNA sequences (TTAGGG) that form a protective cap at the ends of chromosomes. During somatic cell division, there is a progressive loss of telomeric repeats. "This process may eventually result in cellular senescence [state of being old; the process of becoming old] or apoptosis [cell death]."
2) Telomere length is emerging as a marker of biological age, integrating the "cumulative lifetime burden of genetic factors and environmental stressors independent of chronological age."
3) "Telomere length is an emerging marker of biological age that independently predicts morbidity and mortality."
4) "Increased dietary intake of marine omega-3 fatty acids is associated with prolonged survival in patients with coronary heart disease."
5) "Multiple epidemiologic studies, including several large randomized controlled trials, have demonstrated higher survival rates among individuals with high dietary intake of marine omega-3 fatty acids and established cardiovascular disease."
6) "The American Heart Association recommends increased oily fish intake and the use of omega-3 fatty acid supplements for the primary and secondary prevention of coronary heart disease."
7) Omega-3 fatty acids are cardio-protective for several reasons, including:
   A) Anti-inflammatory
   B) Anti-platelet
   C) Anti-hypertensive
   D) Anti-arrhythmic
   E) Triglyceride-lowering
   F) Telomere lengthening
8) For each 1-Standard Deviation increase in omega-3 fatty acid levels, there was an associated 32% increase in the telomeres.
9) "Baseline levels of marine omega-3 fatty acids were associated with decelerated telomere attrition over 5 years. The association was linear and persisted after adjustment for potential confounders. These findings raise the possibility that omega-3 fatty acids may protect against cellular aging in patients with coronary heart disease."
10) Longer telomeres are also linked to taking nutritional supplements, including...
multivitamins, vitamin C, vitamin D, vitamin E, and folic acid.
11) “Omega-3 fatty acids exert direct effects on aging and age-related diseases.”
12) Omega-3 fatty acid supplementation:
   A) Reduces vascular stiffness
   B) Slows age-related cognitive decline
   C) Reduces age-related macular degeneration
13) In animals, “dietary enrichment with omega-3 fatty acids prolongs life span by approximately one-third.”
14) “The present findings identify deceleration of telomere attrition as a potentially novel pathway for the anti-aging effects of marine omega-3 fatty acids.”
15) Oxidative stress is a powerful driver of telomere shortening and aging.
16) Supplementation with omega-3 fatty acids has been associated with lower levels of systemic oxidative stress, and with higher levels of the antioxidant enzymes catalase and superoxide dismutase.
17) Omega-3 fatty acid levels may decelerate telomere attrition by increasing activity of the enzyme telomerase. “Daily supplementation with 3g of omega-3 fish oil was associated with a significant increase in telomerase activity.”
18) Other factors that cumulatively determine telomere length throughout life include:
   A) Systemic inflammation
   B) Obesity
   C) Oxidative stress
   D) Lack of physical activity
19) “In summary, among patients with stable coronary artery disease, there was an inverse relationship between baseline blood levels of marine omega-3 fatty acids and the rate of telomere shortening over 5 years.”

Dr. Dan Murphy graduated magna cum laude from Western States Chiropractic College in 1978. He received Diplomat status in Chiropractic Orthopedics in 1986. Since 1982, Dr. Murphy has served part-time as undergraduate faculty at Life Chiropractic College West, currently teaching classes to seniors in the management of spinal disorders. He has taught more than 2000 postgraduate continuing education seminars. Dr. Murphy is a contributing author to both editions of the book Motor Vehicle Collision Injuries and to the book Pediatric Chiropractic. Hundreds of detailed Article Reviews, pertinent to chiropractors and their patients, are available at Dr. Murphy’s website, www.danmurphydc.com.

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