

# Analysing Natural Possibilities Extending Human Life Beyond Genetics: An Integrative Review

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**Abstract.** Also known as the keys to ageing, Telomeres are repetitive DNA sequences that exist at the end of all human chromosomes. **Objective** of this paper is to explain the importance of Epigenetics in everyday practices, using direct language, showing and simplifying scientific access and popularising ways to being more healthy, including how that acts directly on lengthening or shortening Telomeres. **Method;** an integrative compilation of selectives reviews was carried out on varied articles, chosen and used according to proven academic validation. **Results** showed that humans can extend or shorten life expectancy without interfering with genetic material represented by DNA. Vitamins produced outside the body absorbed in a controlled manner, can act directly on the regeneration of telomerase. Named by Aristotle: Epigenesis, Epigenetics is beyond genetics. **Conclusion** is that Telomeres cells shortening is related to the passage of time, they can shorten to such an extent that they become unable to protect the genetic material, losing part of the essential information when replicating.

**Keywords.** chromosomes; chromosome end-protection; telomeres; telomerase; epigenetics; literature review.

## 1. Introduction

Genomic stability. and integrity must be maintained for an organism to function and propagate successfully. Telo-meres are one of several key elements required for gen-omic stability. (reviewed in Blackburn 1991, 2001).[1]

The senescence process may be related, in addition to the cell division process, as age advances, genetic characteristics, lifestyle and diseases. However, this process can be delayed by telomerase, which is an enzyme that works to reduce the loss telomeric and increasing the lifespan of cells, as it contributes by adding DNA telomere in chromosomes and increasing the lifespan of cells, as it contributes by adding DNA telomere in chromosomes and consequently protecting the integrity of telomeres. (SILVA, et al., 2018).[2] The dynamics telomeric is now considered a strong biomarker of cellular ageing, and its shortening is responsible for the manifestation of chronic degenerative diseases. (SILVA, et al., 2018).[2]

It is clear how people with different habits age so differently, and as many also observe that health is given by the form of quality of life that the individual has. (BORBON; WIETHOLTER; FLORES, 2016; EPEL, BLACKBURN; 2017).[3]

## 2. Research Methods

### Correlated Studies

Almost 40 years ago, Leonard Hayflick discovered that cultured normal human cells have limited capacity to divide, after which they become senescent - a phenomenon now known as the 'Hayflick limit'. Haflick's findings were strongly challenged at the time, and continue to be questioned in a few circles, but his achievements have enable others to make considerable progress towards understanding mechanisms of ageing.[4]

The Nobel Prize in Physiology or Medicine 2009 was awarded jointly to Elizabeth H.Blackburn, Carol W. Greider and Jack W. Szostak "for the discovery of telomeres and the enzyme telomerase".[5]

Ageing is a degenerative process that leads to tissue dysfunction and death. A proposed cause of ageing is the accumulation of epigenetic noise that disrupts gene expression patterns, leading to decreases in tissue function and regenerative capacity.[6]

Using a system called "ICE" (inducible changes to the epigenome), we find that the act of faithful DNA repair advances ageing at physiological, cognitive, and molecular levels, including erosion of the epigenetic landscape, cellular exdifferentiation, senescence, and advancement of the DNA

methylation clock, which can be reversed by OSK-mediated rejuvenation.[7]

## Epigenetics Practices

From a physiological point of view, physical exercise can contribute to weight loss, health maintenance and performance improvement functional impairment of the individual.[8]

According benefits mentioned above, physical exercise presents itself as a resource, non-pharmacological, important in the maintenance of health and fundamental in the prevention, control, and treatment of various diseases.[8]

Amongst the selected studies, aerobic training of moderate to vigorous intensity is most prevalent.[9]

However, several studies suggest that Telomere shortening is also affected by environmental factors, often associated with lifestyle, namely smoking, diet and psychological stress, suggesting that telomere length may be an indicator of general health status. health and biological age of individuals. Therefore, measuring the length of telomeres per se have no biological value, requiring comparison with the telomere length of a reference sample representative of the population (Vera and Blasco, 2012).[10]

This relationship is particularly evident in older individuals, suggesting a role of physical activity in combating the typical age-induced decrements in telomere length.[11]

Chronic psychological stress can lead to disease through many pathways, and research from in vitro studies to human longitudinal studies has pointed to stress-induced telomere damage as an important pathway. However, there has not been a comprehensive model to describe how changes in stress physiology and neuroendocrine pathways can lead to changes in telomere biology.[12]

Under stress, the body ramps up its production of certain hormones, such as cortisol, and other biochemical factors. These compounds help to mediate an appropriate response to short-term stress.[13]

The lengthening of telomeres, responsible for greater longevity, was related to the consumption of fibre (10g specifically would correspond to the lengthening of telomeres equivalent to an average of 5 more years of life), the high total antioxidant capacity of the diet, the adoption of the Mediterranean diet, caloric restriction and the consumption of whole grains, fruits, vegetables, legumes, nuts, seeds, seaweed, low-fat dairy products, eggs, teas and reducing the consumption of saturated and trans fatty acids.[14]

Telomere shortening is accelerated by oxidative stress and inflammation and we know that diet affects both of these processes. A diet with a high consumption of vegetables, nuts, dairy products and

eggs can favourably influence telomere length through anti-inflammatory and antioxidant mechanisms.[14]

The Mediterranean diet, characterised by high consumption of vegetables, fruits, nuts, legumes, whole grains, olive oil and fish, has also been associated with telomere lengthening, due to its antioxidant and anti-inflammatory effects.[14]

## Epigenetics Results

High telomerase activity and a reduced rate of telomere attrition have been observed in endurance athletes, compared to those in inactive controls.[15]

Interest in the effects of diet and physical activity on telomere dynamics is growing, but prospective studies are lacking so far, and the effects of various exercise modalities have not been established.[15]

Combined exercise promoted leukocyte telomere elongation in obese women. Besides, the data suggested that greater waist circumference may predict shorter telomere length.[16]

Aerobic exercise is an ordinary physical activity that is positively associated with telomere length.[16]

Some studies have reported a positive relationship between longer telomere length and other types of exercise when subgroup analysis was performed according to type of exercise, such as resistance exercise and yoga.[16]

Breathing exercises and meditative components have been shown to have positive effects on psychological health, including alleviation of stress, anxiety and depression, which are significantly associated with shortened telomere length. [16]

Recently, both telomere length and telomerase activity have been shown to be influenced by various environmental factors such as oxidative stress, psychological stress, and socioeconomic status. Collins et al. Found that athletes diagnosed with "fatigued athlete myopathic syndrome" (FAMS) had shorter muscle homogenate telomere length than age- and training-matched counterparts. Most recently, Cherkas et al. Found that leisure time PA was positively related to leukocyte telomere length in a dose-dependent manner, providing the first evidence of a role for typical PA in modifying telomere length.[17]

Dietary fiber has a significant impact on health and aging. Numerous studies show that individuals who consume high levels of fiber live longer and experience less disease than their counterparts.[18]

As fiber intake increases, risk of disease and

premature death decreases. In short, fiber consumption is an important part of healthy aging.[18]

The Guidelines recommend the intake of at least 14 g of fiber per 1000 kcal.[18]

Fiber consumption is inversely related to a number of age-related killers.[18]

Besides total mortality, diseases common to advancing age, such as heart disease, stroke, type 2 diabetes, breast cancer, and others are also less common among those with high fiber intake.[18]

The Mediterranean diet (MedDiet) is considered to be 1 of the most recognized diets for disease prevention and healthy aging, partially due to its demonstrated anti-inflammatory and antioxidative properties which may impact on telomere length (TL).[19]

The Mediterranean diet (MedDiet) is a collection of eating habits, determined by sociability, knowledge, intergenerational transmission, and intercultural dialogue going from the landscape to the table.[19]

The traditional MedDiet is characterized by a high intake of vegetables, fruits, nuts, legumes, and grains (mainly unrefined); a high consumption of olive oil but a low intake of saturated fat; a moderately high intake of fish; a low intake of dairy products, meat, and processed meat; and a regular but moderate intake of alcohol (specifically wine with meals).[19]

The results showed no effect of the MedDiet supplemented with extra virgin olive oil on telomere change compared with the control group following a low-fat diet.[19]

The Mediterranean diet score has been used to evaluate the association between the Mediterranean diet and overall mortality, as well as Alzheimer's disease, diabetes mellitus, coronary heart disease, and cancer overall.[20]

The first factor, WDP, was characterised by a high consumption of refined grains, processed meals, fast foods, red meats, sauces, commercial bakery, potatoes, whole-fat dairy products, processed meats, sugar-sweetened sodas, eggs, butter and chocolates. In contrast, the second factor, MDP, was characterised by a high consumption of vegetables, fruits, fish and seafood, olive oil, fruit juices, nuts and non-energetic sodas (Table 1).[21]

Impressively, the study results indicate that participant adherence to the Mediterranean diet is significantly associated with longer telomeres.

These results positively support the benefits of adherence to the Mediterranean diet for promoting health and longevity.[22]

Positive associations were found between telomere length and adherence to the Mediterranean diet and consumption of vegetables and fruits. The results observed for other nutrients, foods or dietary patterns were incoherent although it seems that processed meats, cereals, alcohol and sweetened beverages could be associated with shorter telomeres.[23]

We show for the first time an improvement of obesity indices when an increase in TL is observed after a 5-year Mediterranean diet intervention.[24]

Mean age was 64 years (SD: 9), 55 (20%) were females and 181 (67%) were whites. After adjusting for age, sex, race, CAD risk factors, and total calorie intake, there was a graded association between MDS categories and LTL.[25]

One randomized controlled trial and eight prospective cohort studies (122 810 subjects) published between 2007 and 2014 were included for meta-analysis. For highest v. lowest adherence to the Mediterranean diet score, the pooled risk ratio was 0.81 (95 % CI 0.73, 0.90,  $P < 0.0001$ ,  $I^2 = 55\%$ ).[26]

Inflammation status leads to a progressive telomere attrition linked with the pathogenesis of age-related diseases giving rise to the "inflammaging" concept and the role of nutrition in attenuating this phenomenon.[27]

Telomere shortening is, at least in part, a modifiable factor and there is evidence that adherence to the MD is associated with longer telomeres.[28]

Considerable evidence suggests that consumption of antioxidant-rich foods and/or a diet rich in fruits and vegetables may play a role in telomere biology maintenance and thus impact overall health status and longevity (Lian et al., 2015; Hou et al., 2009).[28]

### 3. Conclusions

'Why is life so complicated?' (Dyson 1999, p. 72). Human life continues to be the biggest mystery of the world. When we analyze all discoveries during the centuries, these mysteries can be more understandable over time. Questions constantly show more importance than answers, because they implicate in new questions. My question is; what will be the next discovery?

Of course we humans will find what we are looking for.

Epigenetic have shown a big natural deal, complementing, supporting, regenerating, rejuvenating, comforting, teaching, all of us how to be more healthy everyday.

The expectative of human's life are exchanged every year ultra passing the idea about how long we can be in our existence in this universe.

In this context I have another question; Why does most part of the mondial population continue living out of the ways and possibilities to live more? Thinking alot about this phenomenon I found a single answer; information. Most humans cannot understand how modifying our routine and diet makes it possible to live more full and complete years of life, being more healthier. Concluding, Epigenesis nominated by Aristotles continues being a key to open locked doors inside us.

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