Paul Artale 20.5.26

Review: Elizabeth Blackburn and Elissa Epel, *The Telomere Effect: Living Younger, Healthier, Longer*, Orion Spring, London, UK, 2017

Pages: 316

Stop Your Shoelaces From Fraying

A mix of psychology, false Eastern religion and mysticism, but useful medical research to protect the 'aglets' of your chromosomes.

Given the references and vast literature, the authors have certainly simplified the data into a digestible, mass-market book. As a result, those looking for a deeper scientific information will have to look elsewhere. However, the limited genetics and biochemistry is helpful enough to understand the basic mechanisms behind dangerous telomere shortening and lengthening.

The authors at the outset warn there is no 'silver bullet' to safely lengthening telomeres or maintain them at juvenile levels; only hard work, attention to diet and exercise, avoidance of environmental chemicals, and key supplements can do this. These are things which any good longevity resource would advise anyway.

Overall, a useful health resource for one's library.

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Introduction: Tale of Two Telomeres (pp. 1-18)

Healthspan vs diseasespan.

Multi-morbidity: diseases which come in clusters.

The Three Greek Fates: one spins your life's thread, another measures it, and the third cuts it.

Telomeres are protective protein sheaths; under 1/10,000th of total DNA. They shorten due to mitosis (cell division) and senescence, ultimately reaching the Hayflick limit when cell division is impossible.

Senescent cells leak proinflammatory chemicals, eventually causing apoptosis.

Age is the greatest determinant of chronic diseases.

A newborn has 10K telomere bps, a 35-year-old 7,700 bps, and a 65-year-old 4,800 bps.

I) How Premature Aging Cells Make You Look, Feel, and Act Old (pp. 19-41)

Stem cell niches exist near needed sites.

Senescents in bone marrow prevent blood and immune stem cells dividing.

Aging: "progressive functional impairment and reduced capacity to respond appropriately."

Aged skin is low in fat pads and hyaluronic acid.

Skin cells protected from the sun can withstand aging well.

Osteoblasts: bone-building cells.

Osteoclasts: bone-busting cells.

Follicle stem cells produce melanocytes; hair is white when they all die. Graying affects at least half by the late forties.

Damaged cells emit help signals (senescence-associated secretory phenotype [SASP]) which telomeres block. This leads to a 'rotten apple in the barrel scenario'.

Inflamm-aging: also causes the many syndromes like Chron's, celiac, asthma, and cancer.

Endothelium is used to protect lining and keep immune cells entering the arterial wall and inflaming it.

Short WBC telomeres are correlated with small hippocampuses. An APOE gene variant is also correlated with Alzheimer's.

II) The Power of Long Telomeres (pp. 42-53)

Tetrahymena is a single-cell pond scum organism with 20 identical chromosomes.

The repetitive human telomere sequence is TTAGGG, of which the GGG segment is most vulnerable.

Telomere DNA is *outside* the genes.

Without protection, genetic material could easily unravel.

Tetrahymena telomeres can protect yeast chromosomes during cell division by donating some bps.

Human telomere count bottoms out at 75; those with longer ones live into their 80s and 90s (a form of survivor bias).

Smoking shortens telomeres.

III) Telomerase, the Enzyme That Replenishes Telomeres (pp. 54-73)

Telomerase restores lost DNA during mitosis; it includes RNA and proteins.

Telomerase-boosting supplements are contraindicated with cancer due to risk of uncontrolled mitosis. Longer telomeres occur in 90% of malignant cancers, so that *shortening* them may be a treatment.

Chronic stress shortens telomeres.

IV) Unravelling: How Stress Gets Into Your Cells (pp. 74-99)

The adrenals release cortisol which releases glucose.

A vagus branch innervates the face muscles.

In a *challenge response* scenario, the adrenal releases cortisol, but the brain quickly shuts it off so there is a net benefit.

Cortisol dampens telomerase.

V) Mind Your Telomeres: Negative Thinking, Resilient Thinking (pp. 92-137)

Short telomeres and high telomerase is a deadly combination.

Conscientiousness is the most consistent predictor of longevity; a 34% increase.

VI) When Blue Turns to Gray: Depression and Anxiety (pp. 138-158)

Each muscle cell has thousands of mitochondria.

MBCT: Mindfulness-Based Cognitive Therapy; as effective as an antidepressant.

VII) Training Your Telomeres: How Much Exercise Is Enough? (pp. 172-187)

Overexercise can create oxidative stress.

Regular exercise reduces adrenal cortisol release and increases insulin sensitivity which stabilises blood sugar. Telomere-protecting protein [TRF2] and TERT increase, and p16 cellular aging factor reduces.

Exercise also release irisin hormone and induces autophagy.

Ultrarunner cells are 16 years younger than sedentary counterparts!

Overtraining damages progenitor ("satellite") cells.

VIII) Tired Telomeres: From Exhaustion to Restoration (pp. 188-205)

Poor sleep cuts REM and increases cortisol and insulin; a prediabetic state.

7-hours' sleep is the cutoff point for telomere health.

MBTI: Mindfulness-based treatment for insomnia.

IX) Telomeres Weight In: A Healthy Metabolism (pp. 206-219)

Under 5% stick to their weight loss plan for 5 years; 95% become "weight cyclers".

CRH: Corticotropin-releasing hormone causes sugar cravings.

Caloric restriction reduces food intake by 30%.

X) Food and Telomeres: Eating for Optimal Cell Health (pp. 220-254)

Alcohol increases C-reactive protein (CRP) in the liver.

ω-3 levels predicted 32% lower telomere shortening chances; 1g of EPA and DHA p.d. is a general consensus.

Homocysteine shortens telomeres; offset by B12.

C , D (2000IU p.d.; 20% increase) and E lengthen telomeres.

A Mediterranean diet increases length.

XI) The Places and Faces That Support Our Telomeres (pp. 255-279)

Poor neighbourhoods, pesticides, cigarette-smoke Cd, Pd, PAHs, dioxins, furans, As, and benzene all damage telomeres (the dioxins actually increase them).

XII) Pregnancy: Cellular Aging Begins in the Womb (pp. 280-293)

Direct transmission: short telomeres from mother to child via epigenetics in her short-telomere eggs.

Protein deprivation is detrimental to telomeres, but can be mitigated by CoQ supplement.

Folate supports the centromere and subtelomere regions from becoming hypomethylated (i.e., the epigenetic tags are lost).

XIII) <u>Childhood Matters for Life: How the Early Years Shape Telomeres</u> (pp. 294-318)

<u>Conclusion: Entwined; Our Cellular Legacy</u> (pp. 319-325)

Societal stress reduction.