Inside This Issue

Nulla facilisi.
Ut tempor est non eros varius pretium. In nisl justo, vehicula a scelerisque vulputate, cursus eu metus.

Donec vulputate gravida condimentum. Vivamus laoreet rhoncus turpis, in posuere leo vehicula eu.

Lorem Ipsum

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Scientific Reports, New Studies and Practical Applications

Telomeres 2017

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Advisory Board Member, RAAD Coalition

OMEGA’S AND VITAMIN D
How these common supplements could help you to live longer

FURTHER RESEARCH INTO TELOMERES AND DISEASE
Discover the latest research on several cancers, inflammation and coronary heart disease.
Introduction

I get it...

You’re doing everything you can to maintain your health, even reverse some poor lifestyle choices you made but sometimes it feels like 2 steps backwards and one step forwards. And there is so much contradictory advice and ‘evidence’ available that it is easier to second guess yourself than to commit to making a positive change.

I understand. I’m a 41 year old mother of 2 little ones who runs 3 businesses and has never had a nanny! Whereas I want to take the best care of myself, for them, for me, for my marriage, spending the time trawling the internet in search of scientific facts usually only yields blogs on the latest health buzz trend from individuals who are only worried about the health of their bank account.

In a world where anyone can write a blog can label themselves an ‘expert’ I want to present to you actual scientific facts and evidence about how to improve your health in simple, easy to digest English with simple, easy to implement advice. Sound good? Why do I present fact when supposition can be made to sound so sexy? Well, when you retell this information to your friends I want you to know you are telling them the truth. Also, I don’t expect you to believe me, you don’t know me, fair enough! But you will believe the studies, trials and award winning, recognised science I present (in plain English, I promise!) I also make a habit of creating businesses that help others, it’s important to me. And that you can google for verification – no scientific studies on that one, I’m afraid!

In this report you’ll discover the latest proven foods, vitamins and practices to lengthen telomeres and to slow down their rate of shortening. And also why telomeres are undoubtedly the most reliable measure of how well you are ageing and why taking care of them is so, so important.

I hope you enjoy reading this and that it sheds some light on some easy choices you can make to enrich this planet with your soul for longer!

With kindness,

Rachael

Literally with my hands full! Busy life, happy heart – wouldn’t have it any other way!
The Clock of Ageing has been Defined

Professor Hayflick’s discovery, coined ‘The Hayflick Limit’ changed the way we viewed ageing and living organisms. His breakthrough began the hunt for that clock that led to the discovery of Telomeres. So significant was the discovery of Telomeres and the enzyme, Telomerase, that Carol Greider, Jack Szostak and Elizabeth Blackburn were awarded the ‘Nobel Prize for Physiology or Medicine’ for their efforts.

Their discovery was made in a single celled animal called Tetrahymena, which is essentially pond scum. Like most great discoveries, the Telomere had humble beginnings!

Unable to identify the enzyme Telomerase in a human, Geron Corporation passed this task over to Dr Bill Andrews, who isolated the enzyme Telomerase in 1997.

In 1961 Leonard Hayflick discovered that there was a mechanism that caused our cells to die. Cells can only divide a certain number of times before they are no longer able to divide and they, quite literally, self-destruct.

A cell’s pre-programmed ability to divide was named the Hayflick Limit after it’s discoverer. At this stage, Dr Hayflick did not know what that mechanism was.

Telomeres were discovered in the 1930’s and seen as ‘tails’ on the end of our DNA. It was noticed they were longer in younger people and shorter in older people.

We have come a long way since then and we now know that the Telomere is the clock that we all have ticking inside us. The reason our cells can no longer divide and therefore die is 100% linked to the length of the Telomere.

Every time a cell divides our Telomere (that tail on the end of our DNA) shortens. And when the Telomere reaches 5000 base pairs (it begins at 10,000 when you are first born) it can no longer divide.

The clock has been defined.

Telomere shortening IS Ageing.

The human race has been looking to reverse this clock for centuries, the fact that we have found our ageing mechanism means we can now look at fixing it.
Within you there is a gene called Telomerase, which are mostly inactive, repressed in fact, so that it cannot do anything. Except in your reproductive cells where the gene freely expresses an enzyme, also called Telomerase.

Your cells divide and the Telomeres shorten (ageing)

Your gene expresses the enzyme Telomerase and the Telomere re-lengthens. (Age reversal)

Your reproductive cells, in essence, are immortal. They are our germ line and our survival as a species depends on this. Think of it this way, if cell division IS AGEING and to make a baby you start with 2 cells and end up with a gorgeous bundle of 3 trillion cells at birth – the amount of cell division for this to occur is massive! Should our germ line not express Telomerase you would end up giving birth to a child biologically ‘older’ than yourself.

Without Telomerase...

The human race would only have survived perhaps a couple generations.

We are not the only species who survive by expressing Telomerase in their germ line cells. Cats, dogs and horses are some of the species that also share the same telomere processes as us.

And there are also species that express Telomerase in all their cells and show no signs of ageing! Tortoises, whales, Lobsters, Planerium worms to name a few. And their incidence of cancer is very, very rare to non-existent.

How curious, I think
that we have found the answer to the Fountain of Youth

It was hiding inside us all along.
There are essentially 2 ways to achieve long, healthy Telomeres. One is to slow down the rate of shortening, the other is to lengthen them.

Firstly, I’ll quickly tell you how to speed them up, just in case you’ve downloaded this report because you want to live a shorter life. You can increase the rate of Telomere shortening by smoking, being obese and speeding up cell division in your body. Unfortunately the need to heal, recover and repair causes increased cell division and when our body has succumb to conditions and diseases that require the healing process it isn’t usually by choice! If you are looking at your skin and the biological age of your skin you can increase the rate of Telomere shortening by increasing the cellular turnover through aggressive exfoliation, damage and treatments that require the healing process to take care of inflammation caused or broken skin.

Now, for the real reason you are reading this report – how to Slow Down the Rate of Shortening (SDRS) and how to lengthen your Telomeres.

From varying cancers to air pollution, metabolic and inflammatory diseases, these reports all unanimously agree that keeping Telomeres long is the key to health. (These are all, bar one, from 2017 and sourced from the Pub Med website, a reliable source for peer reviewed and published medical work.)

You might think, reading this that some of it is just common sense and I would agree with you. It seems logical that breathing in polluted air would not be good for you, but now you can see the proof of damage it is doing to your telomeres, your clock of life. Somehow when science backs up your instincts it seems much more real and can aid in increased motivation to make some different choices to look after your health. Similarly surely the younger, stronger and healthier your cells the less likely you are to get cancer? Yes! Read on for the proof. The fact that some people still debate this – logic AND science – baffles me!

Let’s start with that disease that, at best, is curable with considerable negative side effects to your overall health and wellbeing and at worst is an insidious and very scary prospect...
The first mention is from a study titled: Telomere shortening in human disease. Not only does it clearly state that critically short telomeres can lead to cancer but also how apparent critically short telomeres are in a host of genetic, metabolic and inflammatory diseases.

“Over the past decades, many studies of telomere biology have demonstrated that telomeres and telomere-associated proteins are implicated in human genetic diseases. In addition, it has become more apparent that accelerated telomere erosion is associated with a myriad of metabolic and inflammatory diseases. Moreover, critically short or unprotected telomeres are likely to form telomeric fusions, leading to genomic instability, the cornerstone for carcinogenesis”

For the full article click here: [link]

*please note this article was published in 2013 and perhaps why the ‘general’ concept of critically short telomeres is covered. A good place to start if you are a beginner. Articles, studies and proof like this are likely what prompted more specific investigation into Telomeres, Telomerase and their connections to specific diseases, pathways and conditions.

“Telomere dysfunction fuels genome instability that can lead to diseases such as cancer”

For the full study click here: [link]

“Telomere shortening has been documented in numerous tumor types. Short dysfunctional telomeres are capable of fusion and it is considered that the ensuing genomic instability may facilitate clonal evolution (the way cancers evolve) and the progression to malignancy”.

For the full study click here: [link]

I could go on and on…but these are just a few studies and articles to get you started. There is irrefutable proof that critically short Telomeres can lead to cancer. There are rumours at the moment, largely fuelled by a recently published book that Telomerase can cause cancer. The authors agenda for stating this is unclear and she seems unable to back up this claim with any actual evidence (although her other statements, which are true, have proof to back them up. The cancer scare seems to be just thrown in there) The reason there are no studies whatsoever to back up the claim that Telomerase causes cancer? Because it is not true.

But I don’t want you to just take my word for it. Read these articles and several dozen others (at least!) that prove that the key to avoiding disease and cancer is by keeping your Telomeres long and healthy.
When it comes to your environment you usually have more control over it. So it’s heartening and a little scary, to know that your living conditions, in particular the air you breathe, can have a significant impact on the health of your Telomeres. States a 2017 study: “Long-term exposure to ambient air pollution is associated with telomere shortening.” 137 cancer-free non-smokers were recruited for a 29 year study. Their exposure levels to indoor air were assessed using a face-to-face interview questionnaire, and leukocyte telomere length (LTL) was measured. Accumulative exposure to solid fuel usage for cooking was negatively correlated with LTL.

The LTL of residents who were exposed to solid fuel combustion for three decades was significantly shorter than that of other populations. For sure, socio-demographic factors may play a mediating role in the correlation between leukocyte telomere length and environmental exposure to indoor air pollution. In conclusion, long-term exposure to indoor air pollution may cause LTL dysfunction.

This is the first study to investigate a clear association between indoor air pollution and leukocyte telomere length. I’m sure not that Telomeres have been so positively embraced as a means to eradicating disease that many more practical studies such as this are on the horizon.

For the full study click the below link:

www.ncbi.nlm.nih.gov/pubmed/28448823

Lab tests at Johns Hopkins University School of Medicine show that when stem cells in your lungs that are necessary for oxygen absorption have telomeres that are too short, it disrupts your breathing.

Previously, it was believed that emphysema was just an inflammatory problem. But the Hopkins researchers have shown it is initially a telomere problem that leads to inflammation.

Most diseases known to human-kind have now been linked back to the abundance of too many critically short telomeres.
Evidence proves that higher vitamin D concentrations are associated with longer Telomere length. Vitamin D inhibits the inflammation response/process and thereby diminishes turnover of leukocytes. Leukocyte Telomere Length (LTL) decreases with each cell cycle and increased inflammation. This study further supports the concept that LTL may serve as a cumulative index of an individual’s lifelong burden of oxidative stress and inflammation. Some of the factors that heighten oxidative stress and inflammation are genetic, but others are clearly environmental in nature, and a few may be easily modifiable. For instance, cigarette smoking, obesity, and sedentary lifestyle are associated with shortened LTL. These lifestyle habits are completely in your control for you to change and vitamin D concentrations are easily modifiable through nutritional supplementation or sunshine exposure.

The study noted above (these are 2 very small extracts) was performed on 2160 women aged 18–79 years old. If you are interested in delving deeper simply click this link www.ncbi.nlm.nih.gov/pmc/articles/PMC2196219/ for the full article. Also (slightly unrelated to Telomere length directly here) if you suffer from Auto-immune Disease I recommend you go ahead and read the whole article, there is information about Vitamin D and Auto-immune Disease which you may find helpful.

Again, if you have a strong interest in the scientific proof that comes with Vitamin D and Telomeres, the Journal of Nutrition has some excellent information and studies.
#4 Omega-3

Given the cardioprotective effects of omega-3 fatty acids, it was sought to determine whether omega-3 fatty acid levels were associated with changes in leukocyte telomere length (LTL) over 5 years in a study of outpatients with coronary artery disease.

The observed Marine Omega-3 Fatty acids in this study were DHA and EPA.

My conclusion? High levels of Omega-3 fatty acids are shown to decrease the rate of Telomere shortening in this new study. Over the years Omega-3 has also been observed to slow age-related cognitive decline, assist against vascular stiffness and reduce the incidence of age-related macular degeneration. Well worth ensuring you have adequate amounts in your dietary intake.

The authors of the following study commented that:
Leukocyte Telomere Length (LTL) is a marker of biological age that independently predicts whether patients with cardiovascular diseases will live or die. This longitudinal study observed baseline levels of marine omega-3 fatty acids over a 5 year period.

The higher baseline omega-3 levels were associated with slowing down telomere attrition.

So whereas omega-3 will not lengthen your telomeres, a high level will most certainly slow down the rate of shortening which is certainly very beneficial indeed. Remember the longer they are the more capable they are of protecting your health.

Multiple large, randomized, controlled trials have demonstrated higher survival rates among individuals with cardiovascular disease who have a high dietary intake of omega-3 fatty acids. On this basis, 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.
Telomeres 2017 - Key points

Take heed, the **Hayflick Limit**. Avoid triggering an increase in cellular turnover. e.g. Skin treatments, inflammation, avoidable cellular damage.

The length and integrity of telomeres are maintained to prevent **Telomere Dysfunction**, which has been linked to **Senescence, Aging, Disease, and Cancer**.

**Critically Short Telomeres Can Lead to Cancer.**

Long-term exposure to **Indoor Air Pollution May Cause LTL Dysfunction**.

Increased levels of **Vitamin D3 Are Linked to Longer Telomeres**

Increased levels of **Omega-3 (DHA and EPA) Are Linked to Longer Telomeres**

Practical advice:

The easiest way to apply the research above is to supplement your diet with Vitamin D and Omega-3’s.

My ‘take-away’ from all of my research. Higher Vitamin D levels positively impact the length of your Telomeres (and reduce inflammation which is ageing in itself). Such an inexpensive and easy supplement to take, I used to be inconsistent with my Vitamin D supplement – but not now! Same with omega-3’s. I’m not someone who takes every supplement under the sun just for the fun of it. But the evidence behind these 2 is so strong and positive that it makes it a no-brainer.

Also, the importance of your environment and the air you breathe. Are you cooking often using solid fuel? Hanging out with smokers? Having fresh air is more important than you might have thought. Do your telomeres a favour and seek it out.

Disclaimer: I am not a doctor or a PhD scientist and in this report I have mixed my opinion with scientific and medical studies. You may wish to speak to your chosen health practitioner before adding a nutritional supplement to your diet. I have tried to make the definitions clear between what is my opinion and what is scientific proof. I urge you to delve deeper into these studies if a point I have made interests you.
<table>
<thead>
<tr>
<th>Glossary Term</th>
<th>Definition</th>
</tr>
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<tbody>
<tr>
<td>Accelerated telomere erosion</td>
<td>your telomeres shortening at a greater rate than is ‘normal’</td>
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<tr>
<td>Baseline levels</td>
<td>information found at the beginning of a study, used for comparison later</td>
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<tr>
<td>Cell cycle</td>
<td>the cell cycle or cell-division cycle is the series of events that take place in a cell leading to its division and duplication of its DNA (DNA replication) to produce two daughter cells.</td>
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<tr>
<td>Clonal evolution</td>
<td>a longstanding cancer model, known as &quot;clonal evolution,&quot; tumors arise from normal cells that mutate and generate abnormal offspring that also mutate, forming a mass of genetically varied cancer cells</td>
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<tr>
<td>Exfoliation</td>
<td>the process of removing layers of skin at an un-naturally fast rate in order to increase cellular turnover.</td>
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<tr>
<td>Genome</td>
<td>your complete set of DNA including all of your genes.</td>
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<tr>
<td>Genomic instability</td>
<td>refers to a set of events capable of causing unscheduled alterations within the genome (your DNA) Genomic instability is a characteristic of most cancer cells. It can initiate cancer, augment progression, and influence the overall prognosis of the affected patient and can arise from many different pathways, including telomere damage</td>
</tr>
<tr>
<td>Germ line</td>
<td>the DNA in germ cells (egg and sperm cells that join to form an embryo). Germline DNA is the source of DNA for all other cells in the body.</td>
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<tr>
<td>Hayflick Limit</td>
<td>discovered in 1961 that there is a mechanism that causes our cells to die. Cells can only divide a certain number of times before they are no longer able to divide and they, quite literally, self-destruct. The number of divisions possible is called the ‘Hayflick Limit’.</td>
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<tr>
<td>Inflammation</td>
<td>may be defined as the normal response of living tissue to injury or infection it is part of the complex biological response of body tissues to harmful stimuli, such as pathogens, damaged cells, or irritants, and is a protective response involving immune cells, blood vessels, and molecular mediators.</td>
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Published since 1928, The Journal of Nutrition (JN) was the first scientific journal created solely for publication of nutrition research. Contents include peer-reviewed research reports on all aspects of experimental nutrition, critical reviews, commentaries, and symposium and workshop proceedings.

**Kpb or Kb**

kilo-base pair, a unit of measurement of DNA or RNA length used in genetics, equal to 1,000 nucleotides.

**Leukocyte telomere length (LTL)**

is a complex genetic trait. It shortens with age and is associated with a host of aging-related disorders. A biomarker of aging and a forecaster of longevity in humans.

**Longitudinal study**

is an observational research method in which data is gathered for the same subjects repeatedly over a period of time. They can go on for years, or even decades and always use the same set of subject.

**Malignancy**

term for diseases in which abnormal cells divide without control and can invade nearby tissues. Active and invasive.

**Nmol**

a unit of measurement. Nanomoles per litre

**Oxidative stress**

the process of oxidation happens as our bodies process the oxygen that we breathe and our cells produce energy from it. This process also produces free radicals, which interact with the molecules in our cells resulting in damage. Free radicals are normal. It is only when the amount of free radicals overwhelms the repair process that is becomes an issue. This is what we call oxidative stress.

**Senescence**

the process in which healthy cells cease dividing. When a cell reaches the Hayflick limit it becomes senescent.

**Telomere**

A telomere is a region at each end of a chromosome, which protects the end of the chromosome from deterioration or from fusion with neighboring chromosomes. Telomeres shorten with each round of cell division the chromosomes are shortened by about 25-200 bases per replication.
Telomere contd: However, because the ends are protected by telomeres, the only part of the chromosome that is lost, is the telomere, and the DNA is left undamaged. Leukocyte Telomere Length is used as a biomarker of ageing and a way of predicting morbidity in certain diseases. Known as the ‘clock of ageing’ it measures how much time your cells (and you) have left.

**Telomere shortening**

an unavoidable symptom of cellular division that happens in all human cells except our germ line cells. When telomeres become critically short they are susceptible to mutations which can lead to disease and death. 

**Telomerase**

the name of a gene and also the enzyme that it expresses. In all cells except our germ line cells the gene is repressed and no enzyme is expressed. When telomerase is expressed it relengthens the telomere and can reverse cellular ageing.

**Tetrahymena**

a freshwater, one cell organism that feeds on bacteria.

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