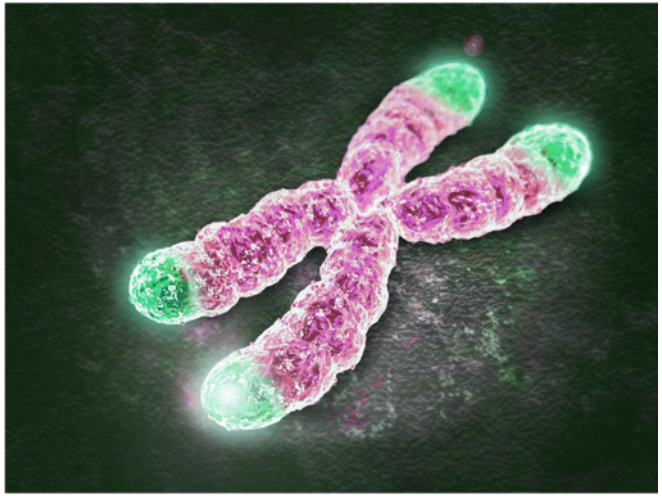
Can we lengthen telomeres with diet & exercise?

A guide by Derek Mulch

What are telomeres?

A telomere is a region of repetitive nucleotide sequences at each end of a chromosome, which protects the end of the chromosome from deterioration or from fusion with neighboring chromosomes.(1)



Why would you want to slow the shortening or even lengthen telomeres?

The telomere is the “clock” of aging that ticks inside every dividing cell of the human body, and in learning how to wind that clock backwards lays the cure for human aging.

- Bill Andrews(2014) *Bill Andrews on Telomere Basics: Curing Aging*

How can we keep our telomeres from lengthening?

An enzyme called telomerase keeps telomeres from shortening too early and can even lengthen telomeres.

Problem is, you can’t just take a telomerase supplement, yet.

You can eat less.

A study conducted by Elsa Vera & colleagues showed sustained lowering of food intake(to the tune of 40% reduction) over time results in an increase of telomere length in adult mice.(2)

And this study from Researchers of the Pennington CALERIE group followed 48 middle-aged individuals for six months adopting different CR protocols ranging from mild to extreme restriction, and found 2 biomarkers of longevity (fasting insulin level and body temperature) are decreased by prolonged calorie restriction in humans.(3)

What can you eat to increase telomere length?

A study (4) published in 2018 looked at fiber intake and telomere length in a sample size of 5,674 U.S. adults.

Researchers found there was a **significant linear relationship** between fiber consumption and telomere length. The more fiber subjects consumed, the longer their telomeres tended to be.

"A difference of 4.8 to 6.0 years in cell aging was found between those in the lowest compared with the highest quartiles of fiber intake. Overall, the present study highlights the risk of accelerated aging among U.S. women and men who do not consume adequate amounts of dietary fiber."

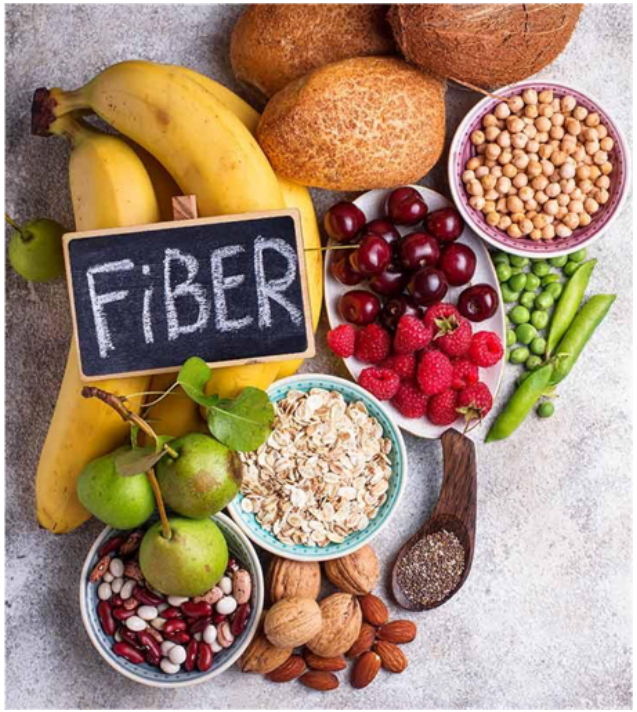
How much fiber?

The study reported subjects were eating an average of 13.6 grams of fiber per day.

This is less than 50% of the Dietary Guidelines for Americans.

The Dietary Guidelines for Americans (2015–2020) recommends the intake of 14 g of fiber per 1000 kcal (5)

- **2000 calories per day = 28 grams of fiber**
- **2500 calories per day = 35 grams of fiber**



What foods contain fiber?

- Lentils
- Beans
- Peas
- Potatoes
- Sweet Potatoes
- Oatmeal
- Whole Wheat bread
- Avocado
- Berries
- Brown Rice
- Almonds

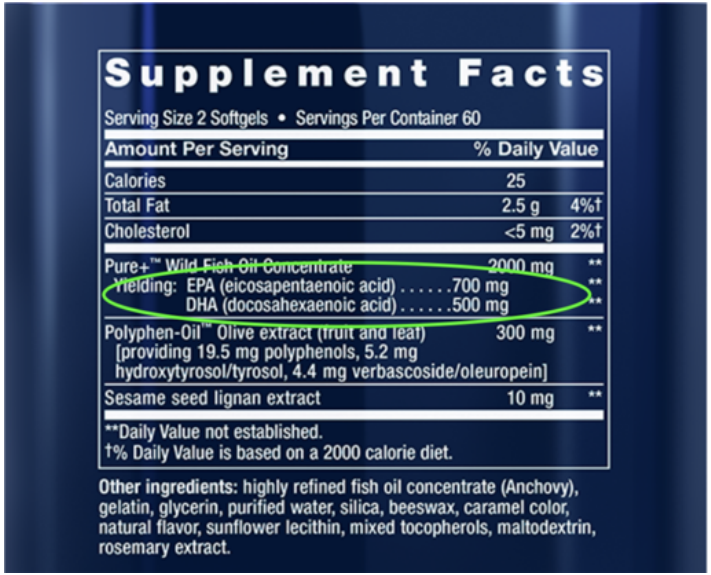
Take fish oil

A study (6) on omega-3 fatty acid supplementation found that taking omega-3 supplements changes the balance of oils in the diet and could reduce cellular aging.

The more the omega-6 to omega-3 ratio decreased, the higher association with lengthened telomeres.

Take 2.5g of fish oil per day.

This is the clinically effective dose found in this study.



Supplement Facts

Serving Size 2 Softgels • Servings Per Container 60

Amount Per Serving	% Daily Value
Calories	25
Total Fat	2.5 g 4%†
Cholesterol	<5 mg 2%†
Pure+™ Wild Fish Oil Concentrate	2000 mg **
Yielding: EPA (eicosapentaenoic acid) .....700 mg	**
DHA (docosahexaenoic acid) .....500 mg	**
Polyphen-Oil™ Olive extract (fruit and leaf) [providing 19.5 mg polyphenols, 5.2 mg hydroxytyrosol/tyrosol, 4.4 mg verbascoside/oleuropein]	300 mg **
Sesame seed lignan extract	10 mg **

**Daily Value not established.
†% Daily Value is based on a 2000 calorie diet.

Other ingredients: highly refined fish oil concentrate (Anchovy), gelatin, glycerin, purified water, silica, beeswax, caramel color, natural flavor, sunflower lecithin, mixed tocopherols, maltodextrin, rosemary extract.

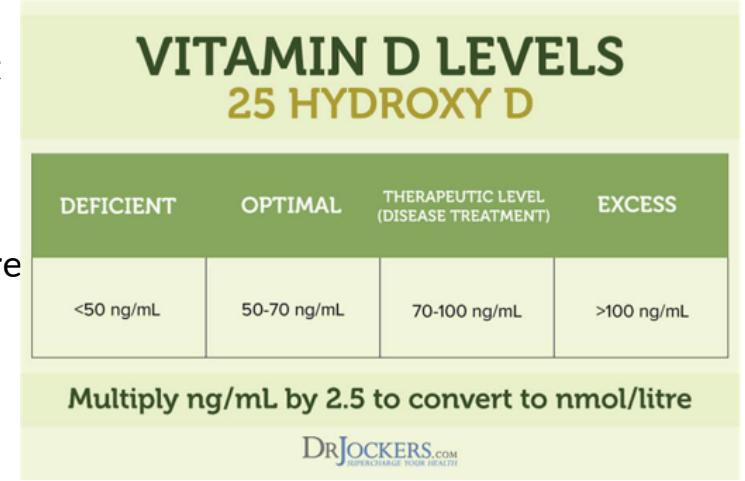
- You're looking for a combined 2500mg(2.5g) of DHA/EPA.

Test Vitamin D levels, and check if supplementation is needed.

Adequate vitamin d levels show positive association with telomere length.(7)

A study published in the Archives of Medical Science found that for each 1 ng/ml higher 25(OH)D level was associated with a 0.045 longer telomere-to-single copy gene (T/S) ratio.

Dosing depends on level of deficiency; higher dose if you're more deficient, lower if close to optimal.



Don’t neglect cardio

A study published in November 2018 in the *European Heart Journal* compared the telomere length and telomerase activity after different types of exercise (8).

The study involved 124 people over a 6 month period, and people were split into 4 groups:

- Resistance Training
- HIIT
- Endurance Training
- Control Group

Don’t neglect cardio

Each group did three 45-minute sessions of their assigned type of exercise each week.

Before and after the study, the telomere length and telomerase activity were measured in the participants white blood cells.

Surprisingly, endurance training and HIIT group increased the length of telomeres, and resistance training **did not.**

But not so fast...

The resistance training group performed a circuit of 8 machine based exercises at a 20rm(rep max).

A rep range as high as a 20rm primarily focuses on a muscular endurance adaptation through metabolic stress, very similar to the act of HIIT or endurance training.

While these findings are surprising, it begs the question as to whether mechanical tension(heavier weight) based strength training would elicit a favorable response?

Research seems to suggest it would(9), at least from a strength and muscle perspective, which is important as you age.

More research is need to answer this question.

Do strength and cardio training

The authors concluded:

> *In summary, this randomized controlled training study shows that specific modalities of physical exercise mediate differential effects on regulators of cellular senescence. The activity of telomerase and TL is increased by endurance training and high-intensive IT but not after strength training.*
>
> *With regard to training recommendations for the prevention of cellular aging, our data support the ESC's current guideline recommendations that* ***resistance exercise should be complementary to endurance training rather than a substitute.***

How to do a telomere lengthening HIIT workout.

Image credit (9)

In summary

- Periodically restrict calories.
- Eat adequate fiber: 14g per 1000kcals
- Supplement with at least 2.5g of fish oil
- Test your Vitamin D levels, and supplement if low.
- Resistance(ideally ***strength***) train 2-3 days a week
- Do HIIT or steady state cardio 2-3 days per week

Resources

1. https://en.wikipedia.org/wiki/Telomere
2. https://journals.plos.org/plosone/article/authors?id=10.1371/journal.pone.0053760
3. https://www.ncbi.nlm.nih.gov/pubmed/16595757
4. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5946185/
5. https://health.gov/dietaryguidelines/2015/guidelines/
6. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3545053/
7. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5206371/
8. https://academic.oup.com/eurheartj/article/40/1/34/5193508
9. https://www.ncbi.nlm.nih.gov/pubmed/26272733
10. https://www.rlecoalition.com/

To Super Longevity

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