

TELOMERES

Calcium

Required cofactor to prevent DNA replication errors.²⁵

Folate Influences telomere length via DNA methylation.^{1,2,3}

B3 Extends lifespan of human cells in vitro; Slows telomere attrition rate by reducing reactive oxygen species in mitochondria.^{4,5}

B2, B6 and B12 Crucial for proper DNA methylation.^{6,7}

Cysteine

Stem cell treatment with N-acetyl cysteine corrects DNA damage in telomeres.⁸

Zinc Important cofactor for DNA repair enzymes; key role in regulating inflammation.⁹

Copper Key cofactor in the potent antioxidant superoxide dismutase that is known to protect telomeres.¹¹

Magnesium Induced deficiency shortened telomeres in rat livers; Regulates chromosome separation in cell replication.¹²

Selenium In vitro supplementation extended telomere length in liver cells; selenoproteins protect DNA.^{13,14,15,16}

Glutathione Interference of glutathione dependent antioxidant defenses accelerates telomere erosion.^{17,18}

Vitamin C Protects DNA from oxidation. In vitro studies show it slows down age-related telomere shortening in human skin cells.^{19,20}

Vitamin E Enhances DNA repair as well as removal of damaged DNA; Shown in vitro to restore telomere length on human cells.^{21,22}

Vitamin D Positively associated with telomere length due to its anti-inflammatory role.²³

Manganese Required cofactor in Mn superoxide dismutase, a deficiency in which decreases telomerase activity.²⁴

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