

# TELOMERES

## Calcium

Required cofactor to prevent DNA replication errors.<sup>25</sup>

## Folate

Influences telomere length via DNA methylation.<sup>1,2,3</sup>

**B3** Extends lifespan of human cells in vitro; Slows telomere attrition rate by reducing reactive oxygen species in mitochondria.<sup>4,5</sup>

## B2, B6 and B12

Crucial for proper DNA methylation.<sup>6,7</sup>

## Cysteine

Stem cell treatment with N-acetyl cysteine corrects DNA damage in telomeres.<sup>8</sup>

## Zinc

Important cofactor for DNA repair enzymes; key role in regulating inflammation.<sup>9</sup>

## Copper

Key cofactor in the potent antioxidant superoxide dismutase that is known to protect telomeres.<sup>11</sup>

## Magnesium

Induced deficiency shortened telomeres in rat livers; Regulates chromosome separation in cell replication.<sup>12</sup>

## Selenium

In vitro supplementation extended telomere length in liver cells; selenoproteins protect DNA.<sup>13,14,15,16</sup>

## Glutathione

Interference of glutathione dependent antioxidant defenses accelerates telomere erosion.<sup>17,18</sup>

## Vitamin C

Protects DNA from oxidation. In vitro studies show it slows down age-related telomere shortening in human skin cells.<sup>19,20</sup>

## Vitamin E

Enhances DNA repair as well as removal of damaged DNA; Shown in vitro to restore telomere length on human cells.<sup>21,22</sup>

## Vitamin D

Positively associated with telomere length due to its anti-inflammatory role.<sup>23</sup>

## Manganese

Required cofactor in Mn superoxide dismutase, a deficiency in which decreases telomerase activity.<sup>24</sup>