Abstract

Life Sci. 1998;63(11):935-48.

Age-dependent telomere shortening is slowed down by enrichment of intracellular vitamin C via suppression of oxidative stress.

Furumoto K, Inoue E, Nagao N, Hiyama E, Miwa N.

Department of Cell Biochemistry, Hiroshima Prefectural University School of BioSciences, Shobara, Japan.

BACKGROUND: Telomeres in eukaryotic somatic cells are destined to the age-dependent shortening, which has not been demonstrated to correlate to direct lesion of telomeric DNA by reactive oxygen intermediates (ROI); still less explicable is the inhibitory effect of ROI-scavenging on telomere shortening.

METHODS AND RESULTS: Here, we succeeded in artificial slowdown of age-dependent telomere shortening to 52-62% of the untreated control, in human vascular endothelial cells, by addition of the oxidation-resistant type of ascorbic acid (Asc), Asc-2-O-phosphate (Asc2P), which concurrently achieved both extension of cellular life-span and prevention of cell size enlargement indicative of cellular senescence. The results are attributable to a 3.9-fold more marked enrichment of intracellular Asc (Asc(in)) by addition of Asc2P, subsequently dephosphorylated before or during transmembrane influx, than by addition of Asc itself, and also attributed to diminution of intracellular ROI to 53% of the control level by Asc2P; telomerase activity was at a trace level and underwent an age-dependent decline, which was significantly decelerated by Asc2P.

CONCLUSION: Thus, age-dependent telomere-shortening can be decelerated by suppression of intracellular oxidative stress and/or by telomerase retention, both of which are achieved by enriched Asc(in) but not by extracellular Asc overwhelmingly more abundant than Asc(in).

PMID: 9747894