AEDG, KE GEROPROTECTIVE PEPTIDES – TELOMERE LENGTH AND OXIDATIVE STRESS REGULATORS

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Peptides from the pineal gland (AEDG) and thymus (KE) modulate telomere length in the lymphocytes of young and middle-aged humans. If the initial telomere length was isinitially reduced below the average for the age group, these peptides cause it to increase, while they can decrease it if it exceeds the optimum. The maximum recorded increases in lymphocyte telomere length mediated by the AEDG and KE peptides are 156% and 137%, respectively [4]. Addition of the AEDG peptide to cultured human fetal lung fibroblasts undergoing replicative senescence activated the gene expression and synthesis of the telomerase catalytic subunit (TERT). This resulted in a 2.4-fold increase in telomere length and a 1.6-fold increase in the number of cell divisions [3].

The AEDG and KE peptides reduce the level of oxidative stress in cells [2]. It helps to prevent the following sequence of events: transformation of guanine into 8-oxoguanine, destabilization of telomere complexes with TRF proteins, telomere shortening, chromosomal instability, cellular senescence, apoptosis, and carcinogenesis [1, 5]. Such peptide-mediated reduction of oxidative stress breaks the positive feedback loop, i.e.: oxidative stress – export of TERT from the nucleus to mitochondria – TERT to mDNA complex – oxidative stress [1, 5]. This biological activity of these peptides is the mechanism that underlies their ability to prevent tumor growth and to help increase longevity in animals.

Therefore, the peptides AEDG and KE are able to regulate telomere length in a variety of human cells by reducing oxidative stress.

References

1. Coluzzi E., Leone S., Sgura A. Oxidative Stress Induces Telomere Dysfunction and Senescence by Replication Fork Arrest. Cells. 2019; 8(1): 19. doi: 10.3390/cells8010019.

2. Khavinson V.Kh. Peptides, Genome, Aging. Advances in Gerontology. 2014; 4(4): 337-345.

3. Khavinson V.Kh., Bondarev I.E., Butyugov A.A., et al. Peptide Promotes Overcoming of the Division Limit in Human Somatic Cell. Bull. Exp. Biol. Med. 2004; 137(5): 613-616. doi: 10.1023/b:bebm.0000038164.49947.8c.

4. Khavinson V.Kh., Pendina A.A., Efimova O.F., et al. Effect of Peptide AEDG on Telomere Length and Mitotic Index of PHA-Stimulated Human Blood Lymphocytes. Bull. Exp. Biol. Med. 2019; 168(1):141-144. doi: 10.1007/s10517-019-04664-0.

5. Smith-Sonneborn J. Telomerase Biology Associations Offer Keys to Cancer and Aging Therapeutics. Curr. Aging Sci. 2020; 13(1): 11-21. doi: 10.2174/1874609812666190620124324.

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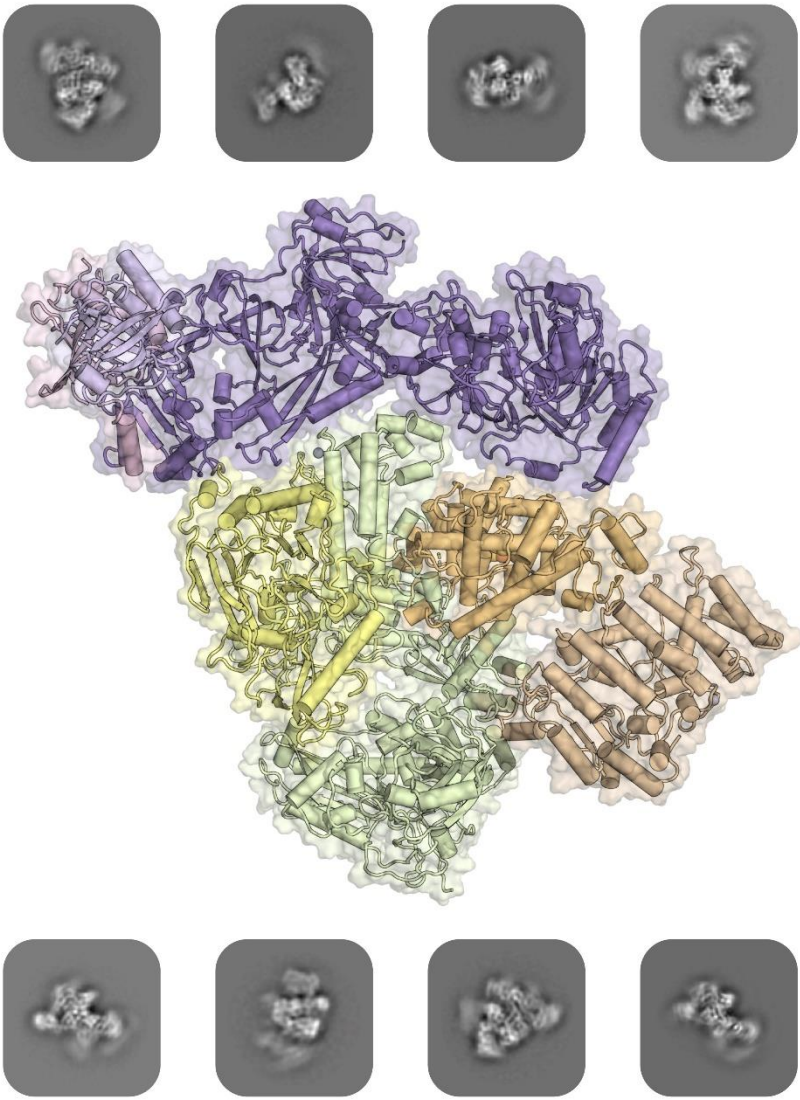

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Vladimir K. Khavinson, Natalia S. Linkova, Ekaterina O. Gutop, Oleg M. Ivko.
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