EXTENSION OF THE IN VITRO LIFESPAN OF HUMAN WI-38 CELLS IN CULTURE BY VITAMIN E

L. PACKER and J.R. SMITH

Dept. of Physiology-Anatomy, Univ. of Calif., and Energy and Environment Div., Lawrence Berkeley Lab., Berkeley, 94720, and Physiology Res., Veterans Administration Hospital, Martinez, Calif. 94553

Normal human cells in culture exhibit a finite capacity for cell proliferation. It has been proposed that this may be an expression of aging at the cellular level. We are investigating the possibility that accumulated oxidative damage may be a major cause of cell senescence and death in vitro. WI-38 cells grown in the presence of 10 or 100 μg dl-α-tocopherol (the major natural membrane antioxidant) per ml medium (added without organic solvents) have a lifespan increased from 50 ± 10 to > 100 population doublings. In tocopherol-treated cells at the 97th passage level, about 95% of the cells are capable of synthesizing DNA, which suggests that these cells are capable of many more population doublings. Tocopherol-treated cells do not accumulate fluorescence damage products, and have morphology and karyotype characteristic of young cells. In acute experiments where cells were subjected to environmental stress by visible light and high oxygen toxicity, tocopherol also protected against the increased rate of cell death. These results suggest that vitamin E may slow the occurrence and accumulation of oxidative damage such that the growth potential and survival of human fibroblasts in vitro is enhanced. These findings have broad implications for the use of human cells in somatic cell genetics and transformation studies, cell culture in general, and may be relevant to mechanisms of cell aging.

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