

TELOMERES: A NOBEL PRIZE FOR THE AGING CLOCK

This year's Nobel Prize in Physiology or Medicine is awarded to three USA scientists **Elizabeth Blackburn, Carol Greider and Jack Szostak** for the discovery of “**how chromosomes are protected by telomeres and the enzyme telomerase.**”

Telomeres, are DNA sequences that repeat at the ends of mammalian chromosomes, undergo attrition with each division of somatic cells and their length is, hence, an indicator of replicative history and replicative potential of these cells. Telomeres play a major role in cellular function and chromatin stability. Fundamental and clinical research in the last 3 decades indicates that telomere regulation and length are key factors in several biological fields such as cancer and aging.

Because of the long lifespan of humans and their short telomeres, attrition in telomere length may be a major determinant of human aging not only at the cellular level, but also at the organ and perhaps the systemic levels.

Actually, telomere length at a given age depends on 3 factors

- telomere length at birth, which is believed to be strongly determined by genetic factors,
- telomere attrition rates, which depend on replication activity and environmental factors such as the level of oxidative stress.
- telomerase activity: the telomerase, is an enzyme capable to restore the extremity of telomeres and thus to reduce telomere attrition during replication. Telomerase is mainly active in germinal cells preventing telomere attrition and thus cellular senescence. Recent works, notably by the Nobel price winners have shown that telomerase activity could be an important regulator and protector of telomere length also in somatic cells.

The results of the recent clinical studies suggest that subjects with shorter telomere length could have a more advanced biological age and an increased predisposition for development of age-related diseases. These discoveries open new perspectives for the detection and prevention of the risk of age-related diseases.

by

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Elizabeth Blackburn (University of California, San Francisco), Carol Greider (Johns Hopkins University School of Medicine, Baltimore) and Jack Szostak (Massachusetts General Hospital, Boston) contributed to the understanding of how telomeres protect the chromosomes from degradation and identified telomerase, the enzyme that preserves telomere length and integrity.