

**МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ РФ
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WHY ARE WE GETTING OLD?

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Aging is a combination of age-related changes in the body that increase the likelihood of death.

Specific signs of aging are revealed at each level of organization of living matter: the structure of chromatin, the level of mRNA in cells, the transcript (a set of mRNA) change, telomeres are shortened in some cells, the expression of telomerase decreases, mutations accumulate in nuclear and mitochondrial DNA (mtDNA), the intensity of oxidative damage to biopolymers.

Progeria is a rare monogenic hereditary disease characterized by signs of accelerated aging. They are of great interest to gerontologists since they demonstrate the importance of genetic changes for aging and make it possible to reveal the molecular mechanisms of the process. Signs of premature aging are characteristic of many hereditary diseases.

It has been shown that with age, mitochondrial DNA accumulates a large number of mutations that are prone to intracellular clonal expansion. MtDNA mutations lead to mitochondrial dysfunction and impairment of energy metabolism. The lowest threshold of sensitivity to mitochondrial dysfunction is in the brain, muscles, and tissues of the eye. It is these organs that are most often affected by monogenic mitochondrial diseases.

The heritability of human life expectancy is small. Approximately 25 % of it is determined by genetic factors, 25 % – by environmental factors (socio-economic, environmental), and 50 % – by lifestyle. Moreover, the inheritance of life expectancy is low if the parents live up to the threshold level of 75–85 years, and very high if the parents live for more than 90 years. Attempts are being made to identify the genetic basis for extreme longevity. There are several places on Earth where the frequency of occurrence of centenarians is high. It's about Okinawa in Japan, about Sardinia in Italy, Seventh-day Adventists in California (USA) are distinguished by longevity. Many studies have identified the association of the apo-lipoprotein E gene and the FOXO3A transcription factor with longevity.

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