

## A possible mechanism for a switching of symmetric to asymmetric mitosis in stem cells and the reversibility of its aging

**Alexander Khalyavkin**

Institute of Biochemical Physics of RAS, Russia

Since the 1970s till 2000s, it has been assumed that the stem cells of the interfollicular epidermis comprise only 10% of the basal layer. The remaining 90% are their amplifying transitory descendants committed to differentiation. We have challenged this concept by suggesting all basalocytes are stem cells. 25 years later, our idea was experimentally confirmed by others. Initially all mitoses in epidermis are symmetric. The choice between symmetric and asymmetric mitosis is related to the stronger adhesion of cycling stem cells to the dermal-epidermal border. The neighboring, weakly adhesive G0-cells are crowded out of the basal layer toward differentiation as the absence of contact with a border is a trigger for differentiation of stem cell. Essentially, a higher mitotic activity can lead to a deficit of G0-cells and an emergence of asymmetric mitoses. Several lines of evidence, including heterochronic parabiosis and cultivation of stem cells outside of suppressing signals of the internal milieu of the aged organism, clearly indicate that age-related changes in somatic stem cells are likely the result, and not the cause of aging. In these cases, the aging of stem cells was reversible. It is assumed that the emergence of aging is connected to a deviation of the organism's regimen from a state of dynamic stability caused by the organism's response to inadequate environmental pressure.

### Biography

Alexander Khalyavkin is the Academic Secretary of Gerontological Society of RAS (Moscow Branch), Senior Researcher of the Emanuel Institute of Biochemical Physics of RAS and Senior Researcher of the Institute for Systems Analysis of RAS. His Alma Mater is the Moscow Institute of Physics and Technology (the Russian MIT). His postgraduate training was at the Gamaleya Institute of Epidemiology and Microbiology. He has completed his Ph.D. in Immunology in 1980. He is author and lecturer of courses "Introduction in Biogerontology" for the Moscow Institute of Physics and Technology (1991-2001). He cooperated with the Max Planck Institute for Demographic Research (2001-2009). He is interested in some theoretical aspects of biomedicine, biogerontology and biodemography. His main aim is a clarification the basic laws of aging and the search for the root causes of this process on the basis of a study of the kinetics of survival and mortality statistics of biological objects and the study of the integrated effect of environmental factors on the rate of aging of living systems. He has developed approaches to the understanding of some aspects of the regulation of reproduction of normal and malignant cells. He studied of non-canonical (growth control) function of the immune system and mechanism for a switching of symmetric to asymmetric mitosis in stem cells.

ab3711@mail.sitek.net/ antisenesesc@mail.ru