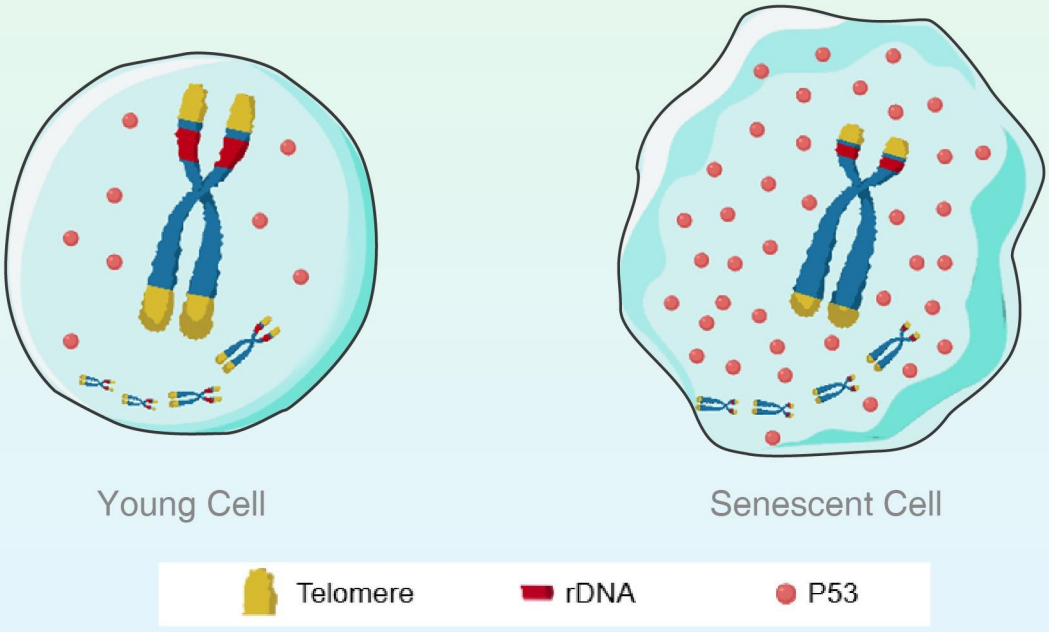
Telomere DNA and ribosomal DNA co-regulation model for cell senescence



Core value of research:

Bilu Huang's research has overturned the traditional understanding of aging, and its core breakthroughs include:

Theoretical innovation:

- For the first time, he proposed that "telomere and/or rDNA-P53 axis" is the core program driving aging, and the molecular mechanism of telomere and rDNA array shortening mediates gene timing expression through P53.

- Breakthrough explanation of the longevity of naked mole rats (telomere extension is actually a compensation for the rDNA arrays shortening) and the mystery of non-dividing cell aging (dominated by the rDNA arrays shortening).

- Provides a new and profound explanation for the aging mechanism behind the huge life span differences between different species.

Technical disruption:

- Point out the intervention path to achieve cell rejuvenation by "extending telomeres and/or rDNA arrays", providing a new target for the development of anti-aging drugs.

- Reasonable explanation of the failure of traditional intervention methods (such as antioxidants, drugs to remove senescent cells, etc.) - failure to touch the core driver of programmed aging.

Industry Foresight:

- Provides a theoretical foundation for stem cell therapy (transplanting homologous stem cells with high copy number of rDNA) and gene editing technology (targeted extension of specific DNA arrays).

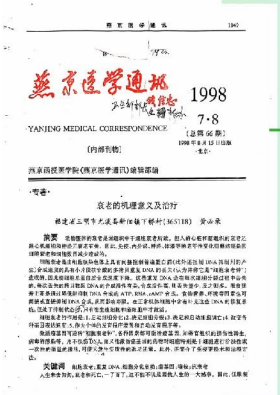
Bilu Huang

My research indicates that aging is essentially a genetic program driven by telomeres and rDNA through the P53 pathway, rather than the accumulation of damage. From the perspective of first principles, the lifespan of species is determined by the shortening rate of telomere and rDNA arrays.

Moreover, in my hypothesis, I speculated that the rejuvenation mechanism of hESCs and hiPSCs does not originate from epigenetic reprogramming, but is due to the significant increase in the length of telomere DNA arrays and 45S rDNA arrays, which has also been confirmed by experiments.

This theory not only explains the aging mechanisms behind the vast lifespan differences among different species but also points the target for the development of truly effective “reverse-aging” therapies—restoring cells to a youthful state by lengthening telomeres and rDNA arrays.

——Bilu Huang


燕京医学通讯 1998
YANJING MEDICAL CORRESPONDENCE
衰老的机理意义及治疗

1998 The mechanism significance and treatment of aging. Bilu Huang. *Yanjing Medical Correspondence.*

2006 The Telomere Age Theory is universal. Bilu Huang. *Journal of China Geriatrics.*

2008 The relationship between ontogenesis and telomeres. Bilu Huang. *Journal of China Geriatrics.*


衰老的生命周期程序启动学说

2011 Life cycle program driven theory of aging. Bilu Huang. *Journal of China Geriatrics.*


细胞衰老的端粒DNA和核糖体DNA共调控假说
Telomere DNA and ribosomal DNA co-regulation model for cell senescence

2021 Telomere DNA and ribosomal DNA co-regulation model for cell senescence. Bilu Huang. *Negative.*

2024 Initial Experimental Verification. *bioRxiv.*


Aging and Disease
Causality of Aging Hallmarks
Bilu Huang*, Xiaowen Hu

2025 Causality of Aging Hallmarks. Bilu Huang*, Xiaowen Hu. *Aging and disease.*

Updated July 2025