Medical Xpress

Lifetime stress accelerates epigenetic aging

December 22 2015

An important risk factor for accelerated aging and age-related diseases is excessive or chronic stress. Scientists at the Max Planck Institute of Psychiatry in Munich have now found how psychological stress, which accumulates over a lifetime, accelerates the aging process. The reason for this are epigenetic changes at binding sites of the receptor for the stress molecule glucocorticoid.

One plausible mechanism that may mediate the adverse effects of stress on the aging process is epigenetic regulation. Epigenetic actions do not change the actual genetic code but alter its accessibility by i.e. attaching chemical groups to or removing them from the DNA. A team supervised by Elisabeth Binder, director at the Max Planck Institute of Psychiatry, investigated the effect of lifetime stress on a DNA methylation-based age predictor in blood samples from a cohort of highly traumatized African American individuals.

"Glucocorticoids are molecular effectors of our response to stress and can exert actions in essentially every body organ via activation of the stress-hormone receptor. The stress hormone receptor regulates gene expression by binding to specific response elements in the DNA. This can also lead to long lasting "epigenetic reprogramming," explains Anthony Zannas, leading scientist in the current study. " We found that such a stress-induced reprogramming happens in sites that are associated with aging."

The study showed that individuals exposed to high levels of lifetime stress were epigenetically older than their true biological age. Such a

premature "biological" aging has been shown to increase the risk for a number of age-related diseases. Exposure to stress may thus lead to more aging-related diseases by long-lasting epigenetic effects induced by the chronic activation of stress-hormone receptors.

Measuring the epigenetic age in peripheral blood cells may be a possibility to identify chronically stressed individuals at high risk for cardiovascular diseases or dementia and to initiate timely prevention programs.

More information: Anthony S. Zannas et al. Lifetime stress accelerates epigenetic aging in an urban, African American cohort: relevance of glucocorticoid signaling, *Genome Biology* (2015). DOI: 10.1186/s13059-015-0828-5

Provided by Max Planck Society

Citation: Lifetime stress accelerates epigenetic aging (2015, December 22) retrieved 9 May 2024 from https://medicalxpress.com/news/2015-12-lifetime-stress-epigenetic-aging.html

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