Biological age-predicting 'epigenetic clock' for studying how to extend lifespan

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Credit: Vera Kratochvil/public domain

Lots of factors can contribute to how fast an organism ages: diet, genetics and environmental interventions can all influence lifespan. But in order to understand how each factor influences aging—and which ones may help slow its progression—researchers need an accurate biomarker, a clock that distinguishes between chronological and biological age.

A traditional clock can measure the passage of chronological time and chronological age, but a so-called epigenetic clock can measure biological age. Epigenetic clocks already exist to reflect the pace of aging in humans, but in order to measure and test the effects of interventions in the lab, BWH investigators have developed an age-predicting clock designed for studies in mice. The new clock accurately predicts mouse biological age and the effects of genetic and dietary factors, giving the scientific community a new tool to better understand aging and test new interventions.

Their results are published this week in *Cell Metabolism*.

To develop their "clock," researchers took blood samples from 141 mice and, from among two million sites, pinpointed 90 sites from across the methylome that can predict biological age. (The methylome refers to all of the sites in the genome where chemical changes known as methylation take place, changing how and when DNA information is read.) The team then tested the effects of interventions that are known to increase lifespan and delay aging, including calorie restriction and gene knockouts. They also used the clock to measure the biological ages of induced pluripotent stem cells (iPSCs), which resemble younger blood.

The research team hopes that their technique will be useful for researchers who are studying new aging interventions in the lab. Currently, it can take years and hundreds of thousands of dollars to study mice over their lifespans and determine the effectiveness of a single intervention. Although it is no small feat to sequence the entire methylome, the new clock could allow for studies to be carried out much faster and on a larger scale.

"This is a new and much needed tool for studying how changes in diet, environment, genetic manipulations and more can influence health and lifespan," said corresponding author Vadim Gladyshev, PhD, of BWH's

Division of Genetics. "Our hope is that researchers will be able to use this biomarker for aging to find new interventions that can extend lifespan, examine conditions that support rejuvenation and study the biology of aging and lifespan control."

More information: Daniel A. Petkovich et al, Using DNA Methylation Profiling to Evaluate Biological Age and Longevity Interventions, *Cell Metabolism* (2017). DOI: 10.1016/j.cmet.2017.03.016

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