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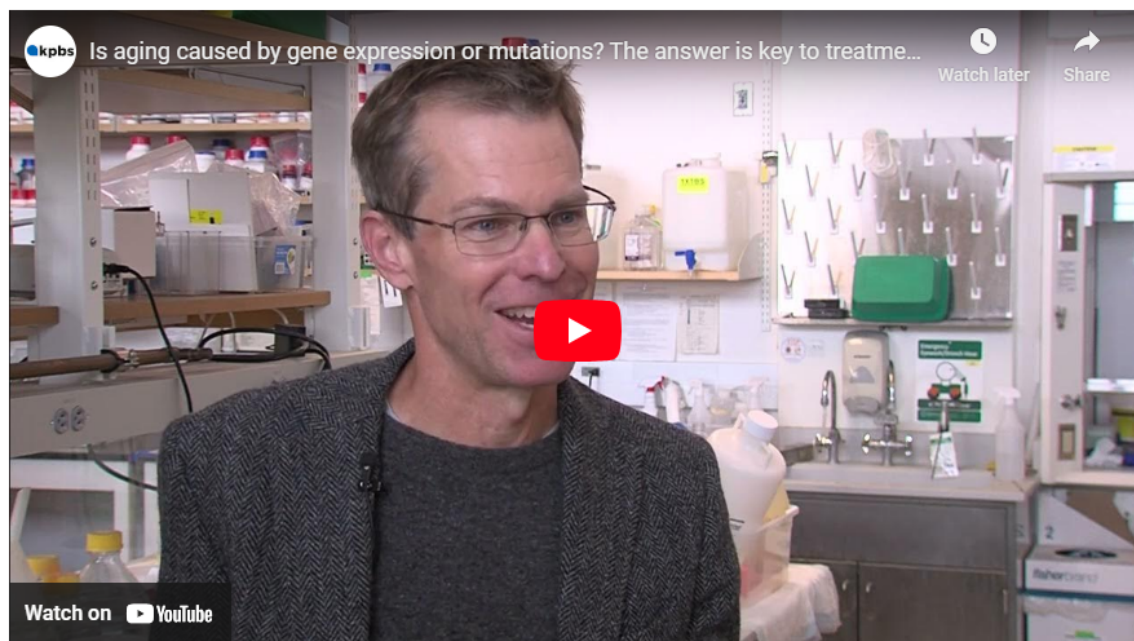
## Is aging caused by gene expression or mutations? The answer is key to treatment

By **Thomas Fudge** / Science and Technology Reporter  
Contributors: **Charlotte Radulovich** / Video Journalist

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What do your genes have to do with growing old? Quite a lot. But is it due to the actual DNA, or the way those genes are expressed? KPBS sci-tech reporter Thomas Fudge has more on new research that raises a question that's key to treating age-related conditions.

All people have a genome and an epigenome. The first refers to the DNA that makes you who you are. The second, epigenetics, is the expression of those genes, or which genes get turned on and off.

A hot topic in life science today is the question of what causes aging. Is it damage caused by gene mutation or by gene expression? Trey Ideker, a professor of health sciences at UC San Diego, said you can think of genes and gene expression as being hardware and software.

"Some people in the field have likened damage to DNA as damage to hardware in a computer. The primary circuit board. As the computer gets older and has been on your desk for 20 years it actually has breaks in wires, and transistors break down and that of course causes the computer to function less well," Ideker said.

The computer software is the gene expression, which tells DNA whether to form a heart cell or a lung cell or, over time, to show signs of aging if the software doesn't get an update.

Changing patterns of gene expression — what scientists call the “epigenetic clock” — are strong indicators of one's biological health. Previous research has suggested that aging is caused by gene expression, a somewhat predictable process that can be reversible.

But Ideker, who helped discover the epigenetic clock about 10 years ago, said that might not be the right answer.

“I think there's been a lot of investment recently in this idea that reversing the epigenetic landscape is going to slow or even reverse human aging,” Ideker said. “I think (this study) has certainly cast a cautionary note that we should also look at the primary causes of some of those changes which are likely to be in the DNA itself.”

[The study](#) he refers to was published in the journal Nature and shows that gene mutations may be the true cause of aging.

Ideker compares gene mutations to lightning strikes that are powerful and unpredictable. If mutations are the true cause, then slowing the aging process becomes much more challenging.

“If somatic mutations are the fundamental driver of aging and epigenetic changes simply track this process, it's going to be a lot harder to reverse aging than we previously thought,” said study co-author Steven Cummings, a research scientist at UC San Francisco.

What's at stake is not necessarily the length of time people live, but their quality of life.

“Many of us think about growing older and what we perhaps fear most isn't dying, but losing the ability to live the lives we want to live,” [said Andrea LaCroix](#), a UCSD epidemiologist.

UCSD doctoral student Zane Koch, the lead author of the Nature study, said the new research hasn't disproved the predictive value of gene expression.

“Now we're kind of looking back on why those epigenetic clocks tick, and it appears it might be through changes in our DNA in the form of mutations,” Koch said.

Researchers say conclusive proof of their theory will require more research, aimed at better understanding gene mutations.

#### Science & Technology



### Thomas Fudge

A journalist with 30 years of experience, Tom covers science and technology stories for KPBS' platforms. He has received recognition for his outstanding work in hosting and public affairs reporting from the Unity Awards, the Northwest Broadcast News Association, and the San Diego chapter of the Society of Professional Journalists.

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