

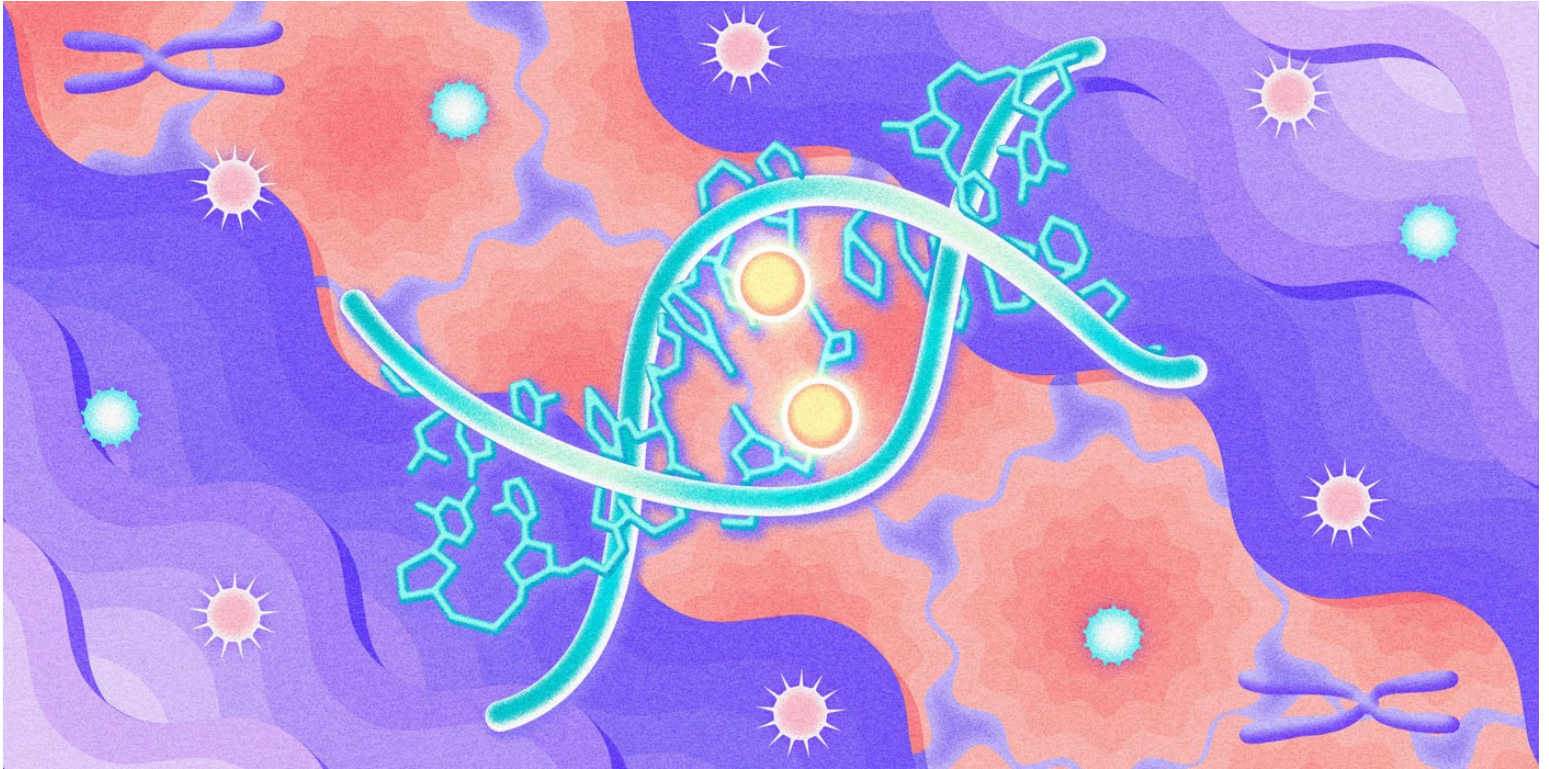


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Oct 25 · 6 min read



Consumer-friendly epigenetic tests promise to reveal your biological age — and give you tips to slow its progress. Illustration by Will Drayson

Reset Your DNA to Slow the Clock

A new epigenetic test that tracks molecular aging claims to show you how to stay biologically young.

For less than a hundred bucks, many companies will take your tube of spit and decode the DNA within. That string of letters holds clues to where you came from and which diseases you and your children could face. By and large, our genetic code doesn't change.

But DNA *expression*—how genes get turned on and off—changes all the time. And with aging and other circumstances, life's blueprint accrues

long-lasting chemical alterations that control how and when certain genes or groups of genes turn on.

Unlike the underlying genetic code, which is fixed, these epigenetic modifications are dynamic. Shifting in response to factors including where you live, what you eat, and how much you exercise and sleep, your epigenetic code influences which genes are easily activated and which never or rarely get turned on. These genome-wide patterns could be an index of health at the molecular level. And you can now see what this code says, thanks to companies using technology that “turns DNA testing into this actionable measure of deep health that you can do something about,” says Toby Call, cofounder of a biotech startup called Chronomics in Cambridge, England.

In February the company started selling a saliva test that measures an epigenetic marker called DNA methylation, which can shift with environment and lifestyle. Customers who get the \$699-a-year basic plan can log onto a web portal to find out their “biological age”—a well-established metric built on research by Steve Horvath, a University of California Los Angeles geneticist and biostatistician.

Obesity may make the epigenetic clock in human liver cells tick faster, and heroin use can accelerate biological aging in brain cells.

Whereas chronological age simply reflects how many years you’ve lived, biological age can vary between two people born in the same year, or

even between identical twins. It depends on how you've lived and what you've encountered. For instance, obesity may make the epigenetic clock in human liver cells tick faster, and heroin use can accelerate biological aging in brain cells. Simply put, biological age reflects how old you *seem*.

Chronomics' DNA analysis might show, for example, that you're biologically two years older than your actual age. Navigating your online account, you could compare your aging pattern with others in your city or age group. Each week you can log what you eat and how much time you sleep, work up a sweat, or do a mindfulness practice such as meditation. Clicking a bright orange bar shows how you might "turn back time" through recommendations to reduce your methylation age by eating fewer processed foods or by adopting stress-reducing activities like yoga.

For an additional \$300 per year, Chronomics' customers can receive scores for two additional indicators: smoke exposure (how many cigarettes it looks like your body has smoked, including from secondhand sources) and body composition (a color-graded map with risk scores for insulin resistance, heart disease and other obesity-related conditions). All are calculated by next-generation sequencing technology that uses big data and machine learning to hone the predictive power of methylation markers at 5 million sites in the genome, says Call.



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He was completing his PhD in biochemistry at the University of Cambridge when cofounders Tom Stubbs and Daniel Martín Herranz started discussing how the DNA analysis technology they were using in their doctoral projects in computational epigenetics might be used "to do something good in the world," Call says. The company is now funded by the global venture capital firm SOSV, which runs the RebelBio and IndieBio life science accelerator programs, and by a seed round of funding from a London VC that Call would not reveal.

"Our message is choice and change," he says. So far, many of the company's hundred or so first customers are people who were interested

in health optimization but hadn't yet chosen a DNA test. At the [Biohacker Summit](#) in Toronto last week, Call says, the company drew interest from health tech enthusiasts as well as folks “off the street”—many of them engineers, doctors, and businesspeople who are “interested in removing the guesswork with their health.”

Where's the action?

The idea that knowing your own DNA methylation status could help you make positive changes seems logical, but lacks scientific support. The promise that “epigenetic marks in apparently healthy people can tell them meaningful things about their health status is an overreach,” says Robert Green, a geneticist at Brigham and Women's Hospital in Boston, who studies how consumer DNA tests influence health behavior.

Using DNA methylation to estimate biological age is great as a research tool, and lifestyle changes such as stopping smoking or losing weight can change methylation patterns. But there's no proof that having that kind of information helps people have better health, agrees Eric Topol, director of the Scripps Research Translational Institute in San Diego. Such claims “are not substantiated,” he says. “It doesn't mean they're not true. There's just no data to support it.”

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Nevertheless, Call says that some doctors and health coaches are excited by the potential of epigenetics to catalyze positive change that enables people to “stay ahead of the disease curve.” Working with clients who are blind to the health implications of their life habits, he says, health professionals “want a telescope to provide people with the unavoidable facts and implications of their environmental and lifestyle factors today—something that until now was impossible.”

By comparison, Chronomics competitor Epimorphy offers no advice or health recommendations with myDNAge, its direct-to-consumer epigenetics test. “We offer [myDNAge] as a tool for people to know if it works for themselves,” says Yap Ching Chew, director of epigenetics technologies at Zymo Research, which developed the platform used by Epimorphy and shares a founder. Their test, which was introduced in July 2017 at \$299, uses next-gen sequencing and measures DNA methylation at 500 sites to compute a person’s biological age from a blood or urine sample. Thousands of people have used the myDNAge test, Chew says.

As the company collects and analyzes more data, it hopes to offer more personalized insights in the future. At this point, she says, many myDNAge clients use the test once or twice a year in the hopes of gauging how well their anti-aging supplements are working.

Compared to the genetic code, epigenetic information seems more changeable in a biological sense but less actionable in a medical sense, Green says.

With genomic data, there are clear links between information received and recommended medical action. For example, says Green, research suggests that certain gene variants increase your sensitivity to specific drugs or increase your risk of certain cancers, so if you learned that you have those DNA variants, you could improve your health by controlling the dosage of that drug or more carefully monitoring for cancer. However, he adds, with epigenetics data very few studies have tested whether health-related advice has any impact on people’s behavior: “We are in the early days of using DNA variance to predict health and motivate behavior change.”

Even though the evidence is still preliminary, says Green, it’s clear that some people are activated by learning about their own DNA, and then they start eating better, exercising, and making other changes well known to improve health: “Learning about health through the prism of your own body ... may motivate people more than learning about it from a public service announcement or from a doctor who says, ‘You know, you should lose a few pounds.’ ”

