People Who Live to 100 Have These Blood Biomarkers In Common

5 MIN READ

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Scientists are analyzing the blood of centenarians to find out: are long-lived people abnormally disciplined, genetically blessed, lucky — or all of the above?

If there's a secret to longevity, the scientists who study exceptionally long-lived people will probably find it first. And while they'll most certainly look at the full picture — lifestyle habits, genetics, environmental factors, and more — some of the most fascinating clues are currently turning up in the blood of people who live to 100.

Aiming to understand what makes centenarians unique, researchers at Boston University's school of medicine analyzed their blood samples and found a handful of markers that some longer-lived people had in common. It's still too early to know whether these markers actually explain why centenarians lived so long or point to any life-extending interventions, but it's a pattern worth exploring, medical experts say.

"It might be that there indeed are these mechanisms popping up that turn out to be very important for longevity and healthy aging, but it's often very hard to prove the causality there," Joris Deelen, PhD, associate professor at the section of Molecular Epidemiology, Department of Biomedical Data Sciences at the Leiden University Medical Center (LUMC) in The Netherlands, tells Super Age. "There's just more work needed to really show if that's the case or that there were just findings by chance."

For now, these molecules offer clues for future areas of research. But someday they could become therapeutic targets for healthier aging, the researchers say.

What the Blood Tests Revealed About the 100-Plus Crowd

In the **new Boston University study**, researchers analyzed 1,495 molecules in blood from 213 people: 80 centenarians, 70 of their children, and 63 controls made up of the children's spouses and members of families without a longevity streak.

Using an "untargeted serum metabolomic approach," one that scans the blood for as many metabolites as possible, then hunts for patterns, they found three things that set centenarians apart. Bile acids ran high, particularly **chenodeoxycholic acid and lithocholic acid**. Certain steroid hormones that normally decline with age held steady. And levels of biliverdin and bilirubin, two byproducts of red blood cell turnover, ran low.

The first two look like good news. When the researchers grouped metabolites into classes and tested them against how long participants lived after the blood draw, higher bile acids and steadier steroids both **tracked with better survival**. The third is murkier. The authors suspect those low biliverdin and bilirubin levels may reflect **a disruption in antioxidant defenses**, and their own analysis sorted these markers into the column of changes tied to worse prognosis — possible signals of end-of-life processes rather than longevity itself.

One caveat worth carrying forward: **no single metabolite** cleared the bar for statistical significance on survival once the researchers corrected for the sheer number of comparisons they ran. These findings hold at the level of metabolite classes, not individual molecules.

The researchers also found that aging is linked to metabolites connected to three things: **nicotinamide adenine dinucleotide** (also known as "NAD," a molecule that helps cells produce energy), the gut microbiome, and oxidative stress.

Separately, they built a "metabolomic clock" — a tool that estimates biological age from patterns across **roughly 200 molecules**. Two markers carried unusual weight, and they pointed in opposite directions. Taurine, an amino acid, predicted a slower rate of biological aging. **Citrate**, a molecule central to how cells produce energy, was the single strongest predictor of a faster one.

Taurine is the more intriguing of the two, because it never registered as significant in the conventional age analysis. The clock caught it anyway, which suggests that pattern-based approaches can surface biology that simpler methods walk right past.

The study reinforces that aging isn't one process but several overlapping ones: energy production, gut health, and oxidative stress all leave separate traces in the blood. It also suggests that when we gather data on hundreds of metabolites, what we learn is likely to be valuable.

The researchers are first in line to flag what this study can't do. It's a snapshot, not a film: blood was drawn once, so there's no way to know whether these patterns produced long life or simply traveled alongside it. The centenarian group is small. The team had **no detailed medication records**, so they couldn't account for what participants were taking. And participants were selected for being **at least a year clear** of any major clinical event and free of major medications — a healthy slice of an already exceptional group.

The design "means we cannot yet determine cause and effect," corresponding author Stefano Monti, PhD, professor of medicine at Boston University, **said in a statement**, adding that the findings need validation in larger, more diverse populations.

Deelen adds a caveat that applies to much of the centenarian-focused research that's out there: it's hard to compare health data from people who live to 100 to people who don't, unless you really plan ahead.

"The best control population for centenarians would be people that were born at the same time and then died earlier, but the problem is for those people you often do not have the data available because you didn't collect the samples," he said. "Alternatively, what you can do is then look at the generation below, so for example, the children of the long-lived people, and compare them to a control population that is of similar age to really deduct what is just an effect of aging itself."

Deelen's Research Adds a Heart Health Tie-In

Deelen's own research echoes some of the same themes. His team is chasing a specific puzzle: people from long-lived families develop their first cardiometabolic disease **roughly 13 years later** than people whose families have ordinary lifespans. Working with the family-based Leiden Longevity Study, they're profiling the blood metabolites and proteins of those families to tease genetics apart from everything else that shapes a life.

In a **preprint posted in May** that hasn't yet been peer-reviewed, the team profiled proteins in 495 participants and metabolites in 329 of them, scoring each person by the share of their ancestors who outlived 90% of their birth cohort. The highest scorers showed a distinctive pattern: lower levels of certain amino acid derivatives and modified nucleosides, and higher levels of a lipid mediator tied to healthy blood vessel function. The researchers read that profile as pointing toward better vascular health, less inflammation, and more efficient tissue repair.

Ten metabolites and nine proteins turned up consistently across all three ways the team sliced the data. None of them survived the statistical correction for running hundreds of comparisons at once — which is precisely the sort of result that needs a second cohort before anyone leans on it. For now it's a promising sketch of what familial longevity looks like in the blood, not a finished portrait.

What We Can Learn From Centenarians Today

So what do the blood samples of centenarians have in common?

"There are two main factors that we often see popping up as being potentially responsible for longevity," said Deelen. "There's the cardiometabolic aspect, so you often see a strong inverse correlation with cardiometabolic diseases like Type 2 diabetes and cardiovascular disease, and many long-lived people seem to be protected against these diseases. Then there's immunity. You often find that they are immunologically protected," he adds.

"The people in the Leiden Longevity Study are genetically enriched, while in other studies long-lived people really optimize their environment through habits like **diet**, **exercise**, and good sleep," he said, adding that abstaining from smoking is also key.

Deelen says it's plausible that these same healthy habits could influence some of the markers found in the Boston University study, such as the liver and gut markers that likely indicate a healthy metabolism.

Then there are the **social** and **mental** factors that aren't as easily measured — at least not yet. "I'm always intrigued by how socially active these people still are, and their view of life in general is always very positive," said Deelen.

As we delve deeper into the data of those who live the longest, we're likely to learn that genes, lifestyle, environment, mindset, and luck all deserve partial credit.

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