

Slowing the Clock on Aging Stem Cells

There is, of course, no stopping time, but a new study found that there may be a way to slow down the clock.

July 24, 2024 By [Damon Runyon Cancer Research Foundation](#)

Blood stem cells, like all living things, lose their regenerative capacity with age. Because blood stem cells generate not only blood but all the cells in our immune system, age-related dysfunction can lead to a plethora of systemic issues in older adults, including blood cancer. There is, of course, no stopping time. But according to a new study from researchers at the Columbia Stem Cell Initiative, including Damon Runyon Fellow James Swann, VetMB, DPhil, there may be a way to slow down the clock.

The study found that chronic inflammation in the bone marrow of old mice induces a process called autophagy, or “self-eating,” in which old cell parts are broken down and reused. This is because inflammation, as the researchers discovered, impairs cells’ ability to metabolize glucose, creating a nutrition scenario that resembles scarcity. Autophagy therefore works as a survival mechanism, preserving blood stem cells in a low-activity state despite the unavailability of glucose. The blood stem cells that did not engage in autophagy, on the other hand, went into metabolic overdrive and eventually stopped functioning. (To bring it to human scale, autophagy is recycling; the alternative is draining nonrenewable resources.)

As the scientists were quick to realize, there is a simpler route to glucose scarcity than chronic inflammation. After twenty-four hours without food, the mice’s blood stem cells showed signs of autophagy. This was not news to the researchers, who published their discovery of fasting-induced autophagy in [Nature](#) in 2017. But this time, they added another step: after a twenty-four-hour fast, the mice resumed eating. Their rejuvenated blood stem cells began generating new red and white blood cells at nearly the same rate as young stem cells.

The same regimen is not recommended for humans, as the equivalent fasting period would be far too long. Instead, the team is working to “identify the pathways that mimic the effect of fasting and refeeding” to keep blood stem cells—and by extension, our immune systems—functional into old age.

“It doesn’t mean that we will begin living to 200,” clarified Dr. Swann’s mentor and lead investigator Emmanuelle Passegué, PhD, in an [interview](#). “But we are in a new frontier, and I think over the next decade we should be able to develop therapeutics that could slow down or stop stem cell deterioration so we can lead healthier lives as we grow old.”

These findings have added significance for cancer patients, for whom fasting (or the therapeutic equivalent) may enhance therapy response by restoring immune function.

This research was published in [Cell Stem Cell](#).

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