

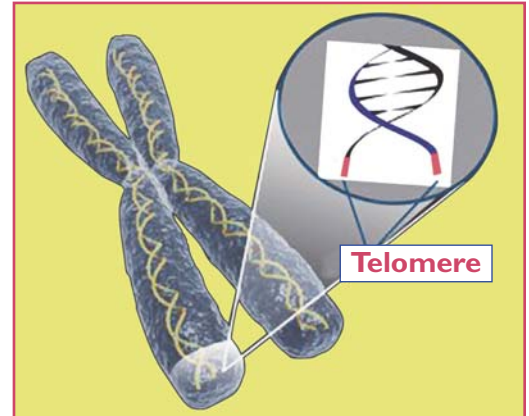
# TELOMERES 101

## What you need to know about this revolutionary science

The search for a cure for aging is as old as humanity itself, but only in the last three decades have scientists finally started to understand how and why we age. The prevailing wisdom used to be that our bodies simply “wear out,” but now, we’ve discovered that aging isn’t an inevitable consequence of living; it’s programmed right into our genes. There is a “clock” that ticks inside every dividing cell of our bodies.

This “clock” of aging is telomere shortening. The telomere is a region of DNA at the end of each of our chromosomes. Because our cells lack the ability to replicate to the very end of our chromosomes, the tips of our chromosomes get shorter every time our cells divide. When a cell’s telomeres get too short, its chromosomes become unstable, and chromosome rearrangements and mutations occur. This causes the cell to become less healthy and eventually unable to divide, which in turn can lead to diminished health as well as aging itself.

It is still a controversial claim that telomere shortening is the primary cause of aging, but the evidence supporting that claim has begun to pile up, especially after experiments involving an enzyme called telomerase that can reverse telomere shortening. These experiments have added more and more support to the theory that reversing telomere shortening would reverse aging.



For example, it has been discovered that old skin cells altered to produce telomerase will grow into skin that both appears to be young and has the genetic profile of young skin. And, just last year, scientists genetically engineered mice that had a telomerase “switch” in their DNA; when this switch was turned off, the mice became, by many measures, physically younger, and we saw an animal aging in reverse for the first time in history. The potential of telomerase induction therapy has become clearer, and the 2009 Nobel Prize in Medicine was awarded to scientists for their early work on telomere biology.

Although the vast majority of our cells do not ordinarily produce telomerase, they can be “instructed” to do so by the presence of a chemical compound. My company, Sierra Sciences, discovered many of the first compounds ever known to do this. These were untested synthetic chemicals that were unfit for human use. I have devoted my recent research to looking for safe, effective nutraceuticals with a history of human use that could induce telomerase in our cells.

There are many anti-aging products on the market today that target other “causes of aging,” including mitochondrial dysfunction and oxidative stress. Those two “causes of aging” certainly do have an effect on our aging process. But new research has shown that telomere shortening is the core pathway of aging – the “king-pin” of all the mechanisms by which we age. (See: Sahin et. al, Nature. 2011 Feb 17; 470 (7334): 359-65.) Oxidative stress and mitochondrial dysfunction are largely symptoms, not causes, of aging.



Mitochondrial dysfunction causes aging – but telomere shortening has turned out to be the primary cause of mitochondrial dysfunction. And humans’ natural defenses against oxidative stress are really quite exceptional (for example, our cells produce ten times more Superoxide Dismutase, a potent natural antioxidant, than mice) – until telomere shortening begins to degrade those defenses inside our bodies.

So, the anti-aging therapies of years past merely treated the symptoms of aging. New research is devoted to identifying a new class of therapies that treat aging at its root cause, and hold great promise of one day allowing us to feel young and healthy at 120 years of age and beyond.

*By William H. Andrews, Ph.D.*