We are near 'escape velocity' for our life expectancy

My View

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When I was born in 1939, the statistical life expectancy for people was 62 years. This would remain my fate if nothing changed. But, over the ensuing decades, science made great strides in many fields, all of which contributed to increasing humans' prospects for a longer life. A baby born today can expect to live to be 79. That's 17 years longer than when I was born.

Because of those same advances in science and technology, my life expectancy also increased every year that I lived. I have received sophisticated medical treatments and take a range of advanced medications that keep my diseases at bay. Most of these innovative therapies were not even available 30 or 40 years ago. According to an online, life-expectancy calculator that considers my individual situation and lifestyle, my life expectancy is now 91.

Up until recently, the increase in longevity for humans has been changing at a linear rate, a little over two years per decade. But, because of many recent breakthroughs in a wide range of fields, the increase in longevity is about to shift into an exponential rate of change. When it reaches the point where, for each year that you live, your life expectancy increases by more than a year, humans approach the longevity "escape velocity." Life expectancies will then have increased more than 10 years per decade. And, at that point, 100 years old will become the new 60.

Ray Kurzweil, who lives in Newton and is a world-famous, MIT-bred inventor and futurist, forecasts that we will reach longevity "escape velocity" by the end of this decade. He may be optimistic, but he believes that there is a convergence of significant developments in many fields that will contribute to this extension of the human lifespan. The technologies he is considering include artificial intelligence, cloud computing, networks, sensors, robotics, massive datasets, biotechnology, and nanotechnology.

An example of a biotechnology development that could be very significant in extending life will be the availability of 3-D printed, replacement organ parts. It sounds like science fiction, but we may see some examples hitting the market this year. Organovo, a California-based company, was the first to successfully engineer commercially available, 3-D-bioprinted human livers and kidneys. In fact, some scientists are saying that, by 2028, death by organ failure may become a problem of the past.

While Dr. David Sinclair may not share Ray Kurzweil's level of optimism about the timing to reach longevity escape velocity, he does believe that the first person to reach the age of 150 is alive today. Sinclair is the director of Harvard Medical School's Paul F. Glenn Center for Biology of Aging Research. He and his associates, are working on a particular biotechnology development that will contribute to achieving that goal.

Up until recently, normal aging has been assumed to be associated with the accumulated mutations, or unexpected changes, to a human's DNA. That's the molecule that carries all of our genetic information. These mutations gradually interfere with the normal functioning of the body. and organs and other body parts deteriorate to the point where their normal roles cease.

Even with today's advanced technologies it is difficult to alter DNA to the extent that all of the DNA mutations can be halted or reversed. You would need to repair literally trillions of the changed genes to reverse the results of aging. Fortunately, Dr. Sinclair and his associates from Harvard Medical School found a way around that problem.

They discovered that they could reverse the aging clock in laboratory mice by altering the animal's "epigenome". This is a suite of molecules that turn the mice's DNA on and off in different body tissues. and altering the epigenome is much easier to do than altering the DNA itself.

Sinclair already has an epigenome-altering drug in development that resets the age of a monkey's eye in order to cure its blindness. He believes that this same technology can be used to reset the age of any part of the body. That includes the brain. In tests on mice, after treatment using this drug, very old, individual rodents were able to learn again.

The hope Sinclair has is that his team will ultimately be able to set back the human body's clock so that it can then fight diseases whose incidences increase with age. These include cancer, heart disease and Alzheimer's. It would be an entirely new way to treat the most serious diseases affecting humankind. and individuals would look and feel much younger as well.

The Harvard team are very hopeful that they will succeed in the development of this technology in the next several years. Their primate studies look promising and human studies will follow soon after the tests on the monkeys are completed.

Because of Sinclair's publications in medical journals, many other researchers are pursuing similar research tracks. Sinclair estimates that about $5 billion has been invested recently in anti-aging drug development. So, he is confident that someone will succeed in the near future in proving the efficacy of the Harvard approach in humans.

One of Sinclair's close associates at Harvard Medical School, Jae-Hyun Yang, said, "These technologies are developing now, and the speed of development is getting faster and faster. So, I don't think it's far away that people will live to 150."

Anthony J. Marolda has degrees in physics and lives in Annisquam.

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