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Another Medical Revolution Is Under Way

Twenty years ago we couldn't have imagined cell-therapy applications, but they're a reality today.

By Michael Milken

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Polio was such a threat in 1950s America that some people thought the need to build "iron-lung hotels" would bankrupt the nation. In 1987 Oprah Winfrey told her TV audience that "1 in 5 heterosexuals could be dead from AIDS in three years." Senior California officials in March 2020 warned that half the state's 39 million residents could be infected with Covid in two months and that five million needing hospitalization would overwhelm the fewer than 100,000 available hospital beds.

We sometimes forget that, as recently as the 19th century, people suffered through gruesome surgeries without anesthesia and childbirth without antiseptic procedures. The first part of the 20th century saw only slow progress in clinical medicine. Medical research was sporadic, and one of the few bright spots was the advancement of public health, which saved millions of people through basic sanitation.

Even by the early 1970s, when I began using my resources to support medical research, doctors for the most part still could only observe the human devastation caused by the most serious diseases. They had little in their arsenal to treat such conditions. The situation began to improve only as research uncovered disease mechanisms at the genetic, molecular and cellular levels.

Science now allows us to respond to health crises with antibiotics, polio vaccines, statins, genome sequencing, immunotherapies, monoclonal antibodies, anti-retroviral cocktails, robotic surgeries, advanced nutrition, powerful new diagnostic scans, focused ultrasound, artificial intelligence, Crispr gene editing and mRNA vaccines. The achievements of medicine over the past half century have been stunning: heart disease cut in half, AIDS increasingly controlled, cancer deaths heading down, several hereditary defects corrected, Covid vaccines delivered in record time.

Twenty years ago, the idea of putting a live cell in a human, directing it to travel to a specific location, and having it do a specific task would have been considered impossible. Today it's reality, and hundreds of companies are working on cell-therapy applications.

That's only the beginning. As I note in my new book, "Faster Cures: Accelerating the Future of Health," advancements arriving at an exponentially increasing rate lie ahead as new discoveries reach the clinic with breathtaking speed. We can now reasonably speculate about therapies that will give us the ability to clean tiny cancers from our bodies as routinely as dentists clean our teeth. We can look for the possibility of gaining immunity from dozens of viruses with a single vaccine and editing genes to eliminate many birth defects. We can picture growing new organs from patients' own cells and even slowing the aging process.

The driving force behind this progress is the astounding advance of our ability to produce, manipulate, store, retrieve and transmit data. Faster, cheaper, more communicable data have revolutionized medical research. No longer is a lone scientist working at a laboratory bench likely to produce medical breakthroughs. Science is now a team activity. In cancer studies, the primary investigator behind any one advance might rely on the specialized skills of a radiation oncologist, a disease-specific biologist, an evolutionary ecologist, a biophysicist, a geo-biologist and an evolutionary-dynamics expert. Even game theorists can contribute by modeling the Darwinian rivalry by which cells compete to become a successful tumor. The teamwork of such experts often takes place in multiple countries, but technology knits them together as a seamless creative unit.

New computational tools are accelerating progress in every corner of medicine. Physicians can target cancers more precisely with the right drugs, in the right amounts, at the right time, with fewer side effects, because they can now sequence actual tumors. Scientific understanding of the immune system, blood components and the microbiome has grown by orders of magnitude. Our increased ability to sequence gut microbes allows more-precise nutrition.

Meanwhile the lead time for vaccine development is shrinking. What used to take years can be completed in days. By harnessing artificial intelligence, machine learning and massive computational power, scientists can now design drugs from scratch inside a laboratory computer.

Despite all this progress and exciting future prospects, such challenges as health equity remain. Those of us in the wealthier nations live years, often decades, longer than the average African, Latin American or South Asian. A study found that on a 20-minute subway ride from Midtown Manhattan to the South Bronx, neighborhood life expectancy declines by 10 years—six months for every minute on the train. The study goes on to say that "between the Chicago Loop and the West Side of the city, the difference is 16 years." Similarly, a National Institutes of Health study found that in central Baltimore, a man can expect an average life of 63 years. Five miles away, in the Greater Roland Park/Poplar Hill neighborhood, it's 83.

Even with access to the best medical care, too many people continue to destroy their health through neglect or abuse. That's why I felt compelled to include a chapter on prevention in my book. It's great when medical science develops a new cure; it's even better when we can prevent disease from occurring in the first place. As one pharmaceutical executive told me, "The next great drugs will be prediction and prevention." The more we resolve to focus on such social determinants of health, the more we will reap the benefits of the amazing revolution in life sciences.

Mr. Milken is chairman of the Milken Institute. This is adapted from "Faster Cures: Accelerating the Future of Health," which will be published Tuesday.