

Defying Death

Medicine's
Journey
Toward
Immortality

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Prologue

Increases in human life expectancy have over the centuries relied in large part on the effectiveness of medical science's attempts to prevent the occurrence of disease or to successfully treat disease when it does occur. For millennia, healers of all types have labored tirelessly in their efforts to prolong life. Indeed, one of the universal responsibilities all doctors tacitly acknowledge is to keep their patients alive and well for as long as is humanly possible. This axiom has weathered the storms and vicissitudes of history in all parts of the globe. It has been embraced by Chinese acupuncturists, Siberian shamans, Navajo medicine men, medieval bloodletters, and the Memorial Sloan Kettering Cancer Center—as well as the “Father of Medicine,” the classical Greek Hippocrates (ca. 460 BCE–ca. 375 BCE), who admonished his students to “help the sick” and to “do no harm.” The fact that all practitioners of the healing arts, although representative of different cultures and periods in history, are similarly committed to maintaining the well-being of their patients speaks to a belief that humanity can overcome some factors that otherwise would shorten life

spans. All healers, then, answer in their own way to the same call to prolong human life.

Despite working within the limits of what current medical practices can achieve, extending a patient's life has taken on a far greater potential in the world of twenty-first-century medicine. As ever-improving drugs, therapeutic and surgical procedures, and diagnostic tools become available to the public, patient longevity typically follows suit. Demographic studies of life expectancy generally depict upward trends at times when science, especially medical science, is on the ascendancy. And during those valued moments when a particular medical discovery surfaces that proves to be applicable and effective far beyond its original expectations, a comparable increase in life expectancy will be the telltale outcome.

Such a response followed the fortuitous discovery of penicillin in 1929. An antibiotic used in the treatment of bacterial infections, penicillin enjoyed and continues to enjoy extensive and unparalleled success when properly prescribed. "Prior to this discovery," Massachusetts General Hospital's Nicole McFarlane points out, "infections such as bacterial endocarditis, bacterial meningitis, and pneumococcal pneumonia were often deadly. Penicillin's discovery then sparked a new era of medicine where doctors finally held a powerful tool in their hands to stop the spread and fatality of infectious diseases."¹

In addition to antibiotics, vaccines, and other key medical discoveries that increased human life spans, a second public health trend contributed significantly to that prolonged longevity—namely, the rise in sanitary practices beginning in the late 1800s and early 1900s. This included the habitual employment of simple measures such as handwashing, use of antiseptics in operations and other medical procedures, and other forms of cleanliness. Indeed, public sanitary advances are often driven by and/or beholden to medical research and invention, and the two have repeatedly seemed to springboard off one another over the past couple of centuries, steadily increasing human longevity in the process.

Moreover, medical advances that were once the subject of science fiction are now the building blocks of tomorrow's breakthroughs. Physicians treat not only the body—the *corpus*—of their patients but also the cells and subcellular organelles residing within. Also, we live in an age of modern medicine that operates on the molecular level. If cellular degeneration, an important cause of aging, ever becomes just another disease to be treated, perhaps we can anticipate life expectancy to experience double- and triple-digit increases, which conceivably would carry humanity's life span even beyond that which nature has thus far allotted. And to highlight the obvious, we have only taken our first steps on the path to a brave new era in modern medicine.

Defying Death: Medicine's Journey Toward Immortality

is an attempt to outline where medicine has traveled in the past and to chart where it may be heading in the future. More specifically, this work endeavors to illustrate how advances in modern medical technology often leave in their wake increases in human life expectancy. In the words of researchers at the United Kingdom's Tony Blair Institute of Global Change, "One of humanity's greatest success stories of the past century is the increase in global life expectancy as a result of the social and medical advancements that have dramatically improved basic living conditions and reduced vulnerability to infectious diseases."²

As we ponder this exciting odyssey in medical science, one telling question begs to be answered: is this a story without an ending? That is, will every new century or millennium fashion its own singular contribution to the number of years each human's body and mind can expect to survive? And will this continue indefinitely? Or does the story of humanity reach a chapter (or perhaps a "grand finale") in which the body will no longer be needed? Could it be that the collective consciousness of humanity will reside and hopefully even flourish on the hard drive of a computer (or some other such device), creating an almost endless future—one that a small but steadily growing number of distinguished scientists,

Prologue

scholars, and transhumanists believe is humanity's ultimate fate?

Notes

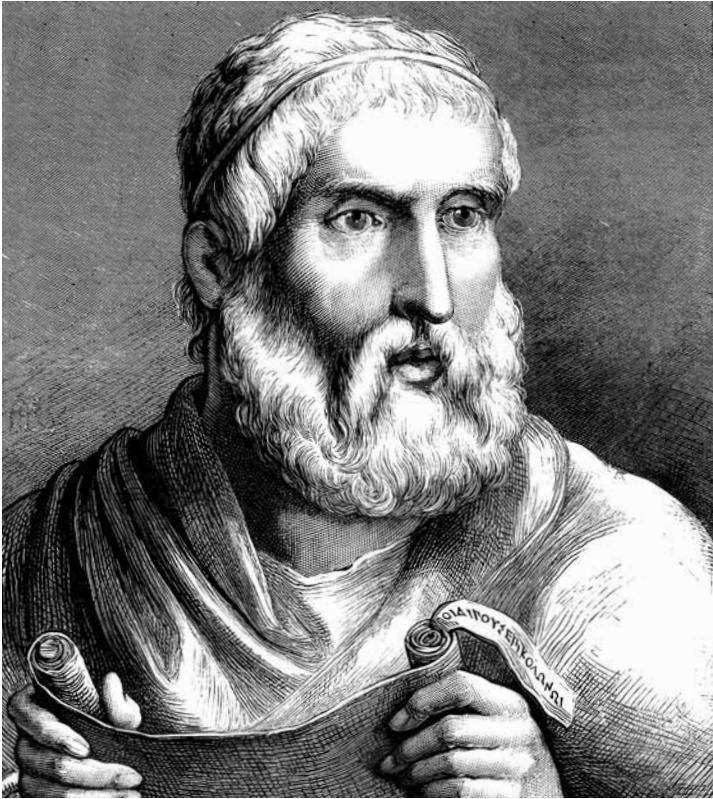
1. Nicole McFarlane, "The History of Penicillin," Allergy and Asthma Center of Boston, February 4, 2020. www.allergyasthmaboston.com.
2. Karen Hooper et al., "Live Longer or Healthier? The Science That Is Making Both Possible," Tony Blair Institute for Global Change, November 5, 2021. <https://institute.global>.



Chapter One

The Medicine of Yesterday

The road that has taken us to our current life expectancy has been painfully long, and we, the travelers, have been weighed down by disease and ignorance. Throughout the greater part of human history, doctors and other practitioners of the healing arts have been largely unsuccessful at realizing all—or at times even part—of their quest to extend the lives of their patients. As a result, incalculable numbers of human beings, generation upon generation, have faced predictably early deaths. Although demographic estimates tend to vary and often lack accuracy because of their imprecise and contingent nature, most scientists and medical historians would likely agree that the archaeological and historical records of humanity for virtually all but the past three or four centuries reveal a life expectancy falling somewhere between thirty and forty-five years. However, this does not mean that human beings of the past never lived longer than that. Verifiable scientific and historical evidence indicates that many did enjoy reasonably long lives. As Australian archaeologist Christine Cave points out, “The



Ancient Greek playwright Sophocles is believed to have lived to the age of ninety.

ancient Greeks classed old age among the divine curses, and their tombstones attest to survival [of some individuals] well past 80 years.”¹ In fact, among the classical Greeks, some of whose ages have been reliably estimated by historians, the great scholar and thinker Plato lived to be about eighty; the noted playwright Euripides died at age eighty-one; and Euripides’s fellow tragedian Sopho-

Glossary

anaerobic: Capable of thriving without free oxygen; most often applied to certain types of bacteria.

antibiotic: A medicine that kills or inhibits the growth of bacteria.

antiseptic: A germ-killing agent.

bacteriology: The study of bacteria.

cardiology: The study of the heart and cardiovascular system and the diseases that can affect them.

chromosomes: Long chains of genes within a cell's nucleus.

CRISPR: A molecular tool used to edit DNA. The letters stand for *clustered regularly interspaced short palindromic repeats*.

DNA: The genetic material that determines the various characteristics of living things. The letters stand for *deoxyribonucleic acid*.

empiricism: The concept that all knowledge derives from detection by the senses.

epigenetics: The study of how human behaviors and the environment cause changes in the expression of genes.

four bodily humors: Throughout the Middle Ages, the practice of medicine was predicated upon the theory of the four humors (blood, black bile, yellow bile, and phlegm). The state of good health was dependent upon the four humors remaining in balance with each other as they circulated throughout the body.

genes: Basic units of heredity found within the DNA of all cells.

genetics: The study of heredity.

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