Biogerontological Research: Shedding New Light On Old Questions Of Longevity And Prolongevity

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Author: Eugene Garfield

The Old Testament reports some rather remarkable life spans. The youngest patriarch, Enoch, died at a comparatively spry 365 years. The oldest, Methuselah, lived to 969. Well, as the Porgy and Bess song goes, "It ain't necessarily so." But the Judeo-Christian tradition is not alone in claiming fantastic life spans. Similar claims have been made in many ancient cultures, including Babylon, Greece, Rome, India, and China.

The maximum human life span is about 115 years. And that has not changed for millennia. What has changed more recently is our life expectancy. The average person in ancient Greece and Rome could expect to live about 20 years. By 1900, this had increased to nearly 50 years. Today, people in developed nations can expect to live more than 75 years.

My interest in this subject goes back more than three decades, when I began a book about it. The term "prolongevity" was coined in 1955 by historian Gerald J. Gruman to refer to the significant extension of natural life span by human effort. Unfortunately, the book was sidetracked by another project--founding and growing the Institute for Scientific Information. But my interest in the topic was recently piqued by Leonard Hayflick's excellent book How and Why We Age (New York: Ballantine Books, 1994).

Hayflick overturned the entrenched dogma in cell biology that normal cells can grow indefinitely outside the organism when supplied with necessary nutrients. This cell "immortality" concept was advanced by Alexis Carrel in 1912 and subsequently became a paradigm for the field. It fostered the belief that aging must be an extracellular process. In a classic 1961 paper (Experimental Cell Research, 25:585-621), Hayflick and Paul Moorhead discovered the opposite--that cultured human cells die after undergoing about 50 divisions. Not only are cells mere mortals, but also aging is indeed an intracellular process. It is perhaps ironic that the individual who debunked cellular immortality has achieved professional immortality via the eponymous route--human cell death at about 50 divisions is now commonly known as the Hayflick Limit.

Hayflick's discovery launched the field of biogerontology, a key area of which is concerned with identifying the "mitotic clock" that triggers cell death. Recent research suggests that telomeres may play this critical role. Telomeres are long, repetitive DNA sequences located at the ends of chromosomes. They become shortened at a fixed rate, like clockwork, with each cell division. When the telomeres are depleted, the genome cannot be fully replicated and cell death ultimately ensues. But cancer and other abnormal cells produce telomerase, an enzyme that promotes the creation of more telomeres, and thereby achieve immortality. This model of aging at the cellular level is still speculative, albeit exciting, and requires further basic biogerontological research.

That is the salient message of Hayflick's book. He points out that just $50 million of the $400 million 1993 annual budget of the National Institute on Aging (NIA) was spent

on basic research into the biology of aging and longevity. The bulk of NIA's funds goes to research on Alzheimer's disease, other brain disorders, injuries from falls, the psychological and social problems confronted by the aged, and other subjects. All of these deserve government funding. But basic biogerontological research merits far more federal support in order to help us reach our maximum life span and- -just as important--ameliorate the inevitable physiological decline that accompanies aging.

The prospect of virtual immortality--extending the span well beyond 115 years--may be a blessing to the cryogenics enthusiasts who would willingly be deep frozen and thawed out at some future time when their diseases have been cured. But for most people, such immortality would be a curse because, as Hayflick points out, "we would become weaker and weaker as the normal, inexorable aging process made our vital organs increasingly less efficient" (p. 338).

Most of us would settle for simply attaining the full 115- year life span, as long as our independence, vitality, and quality of life were assured. Were that to happen, my book would then be a historical perspective on longevity rather than a futuristic speculation on the prospect of immortality .
