

Slowing Aging: Is It Possible?

by Ann Gerhardt, MD September 2015

An excellent 2003 editorial in the Journal of the American Medical Association addresses the notion of “successful aging.” In it, Thomas Glass PhD considers why we even ponder the notion when we don’t similarly worry about successful infancy or successful adolescence. In those cases, ‘successful’ means healthy survival and evolution out of that phase of life. Or, in the case of adolescence it may mean not dead or incarcerated. That doesn’t work for aging, since by definition aging eventually leads to death, not generally assumed to be a healthy or evolving state.

Death is inevitable and preceded by aging, as long as it’s not preempted by an untimely early death. Can we avoid aging? Efforts to do so fall into roughly three categories: psychosocial, biological and image. Most commercial products address appearance, acceding to the idea that the image of youth achieves successful aging, even as inside arteries clog and cancers grow. The psychological approach focuses on stress avoidance, acceptance of the aging process, the ability to roll with life’s punches and general serenity. The biomedical school considers successful aging to be the deferral of disease and disability, focusing on things like inflammation, cell death and genetics.

Many people imagine successful aging as something better than what they view as usual aging. One might encapsulate it as happiness, health, longevity and the capacity to function at a non-compromised, mental and physical level as the years go by. That’s a goal that most people *in their prime* can’t fulfill. For those in their golden years it’s a pinnacle of exceptional functioning achievable by very few.

Aging is not a disease, unless one considers life to be a terminal illness. Even the oldest old,

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who beat the odds of average life expectancy, die of something. To what extent can aging be made “successful?”

For the most part, interventions purported to improve the aging process don’t work. Approaches that do work are generally not implemented by people or their doctors. The medical community doesn’t focus on slowing aging so much as preventing chronic diseases like diabetes and stroke that lead to death. There is also concern about “the timing of a healthy death.” In other words, how sick and miserable do people have to be to let them die? We discuss the wisdom of aggressive treatment for a frail, elderly person that may have unpleasant side effects, especially if it is likely to be futile.

Death doesn’t necessarily mean a failure of aging. Aging relates to what’s going on while a person is still alive. Are there things we can do that promote physical vitality, a youthful appearance and general serenity of “healthy aging”? Understanding how to influence the aging process might require that we understand its basic mechanisms. We’re not there yet. Just when scientists think they have a handle on it, some newly discovered gene or molecular process pops up to modify the paradigm.

This is what we have now: 1) Mortality data about groups of people with exceptionally functional longevity and others suffering early debility; and 2) a variety of specific physiological mechanisms, genes and lifestyle factors which affect the aging process. What we don’t have is 1) a full compendium of physiological processes that affect aging; 2) an understanding of how these processes are initiated and linked; 3) knowledge of which processes will prevail in a given individual to

aid or impede healthy aging; or 4) prescriptions for methods to alter the process.

We know that the body changes over time, leading to functional decline. The brain functions less well, resulting from any or all of: 1) brain cell death, which may be genetically determined; 2) deposits of abnormal protein, as occurs in Alzheimer's; 3) multiple mini-strokes from blood vessels closing off, as in high blood pressure and atherosclerosis; and 4) hormonal loss.

Metabolism slows and enzyme activity declines. The heart and blood vessels stiffen. Arteries clog with plaque containing oxidized cholesterol particles, clot, calcium and scar-like material. Calcium accumulates in damaged joints and blood vessels. Lungs become less elastic. Hair falls out. Muscle mass disappears. The joints' protective cartilage thins and bone density declines. The torso shortens as the spine's discs lose their blood supply and squash flat. Osteoporosis causes a wedge-shaped vertebral collapse, leading to the spine bending forward.

Science has identified a variety of molecular processes and substances in the body that regulate the growth, destruction and repair of the body's cells. These either slow or accelerate biologic aging, chronic disease and longevity. Here are a few factors that **accelerate the aging process**.

- Stress, whether it derives from psychological issues or the physiological consequences of illness or injury, accelerates the body's aging process, likely via hormonal mechanisms.
- Prostaglandins, which cause tissue destruction from inflammation.

- Oxidized fats that induce inflammation in blood vessels and other tissues.
- The absence of sex hormones, which disappear suddenly from women or more gradually from men.
- Collagen, which deposits in areas of inflammation and chronic, even mild, repetitive injury and with aging becomes more cross-linked and stiff.
- Excess glucose, which goes up as the aged pancreas atrophies, binds to proteins and altering their function.
- A protein called progerin, which accumulates in cell nuclei, preventing them from repairing and replacing themselves.
- A fatty substance, lipofuscin pigment that accumulates in and damages many organs.

The body's efforts to **retard the aging**:

- Cellular molecules which stimulate capillary growth and blood vessel repair.
- Genes that regulate cell death rate.
- Proteins that repair damaged genes.
- Sirtuin1 and our cell's anti-oxidants and anti-inflammatory molecules, which reduces oxidation and inflammation, maintain gene function and cellular metabolism and improve cell survival.

Much of the above is determined by our genes. Lest we just give up, thinking that our aging fate is irrefutably fixed, we now know that some gene activity can be modified by lifestyle, including exercise, diet and avoidance of toxic exposures. Yes, we can have some control over 'successful' aging after all. I'll provide more details in the next issue of DrG'sMediSense.