

This is the first article in a multi-part series on the aging process and its relationship to the mechanisms of oxidative stress, including: genetic endowment, lifestyle and diet.

# The Velveteen Rabbit: Healthy at 100

The Skin Horse had lived longer in the nursery than any of the others. He was so old that his brown coat was bald in patches and showed the seams underneath, and most of the hairs in his tail had been pulled out to string bead necklaces.

“What is Real?” asked the Rabbit one day, when they were lying side by side near the nursery fender ... “Does it mean having things that buzz inside you and a stick-out handle?”

“Real isn’t how you are made,” said the Skin Horse. “It’s a thing that happens to you. When a child loves you for a long, long time ... then you become Real.”

“Does it hurt?” asked the Rabbit. “Sometimes,” said the Skin Horse, for he was always truthful. “When you are Real you don’t mind being hurt.”

“Does it happen all at once, like being wound up?” he asked, “or bit by bit?”

“It doesn’t happen all at once,” said the Skin Horse. “You *become*. It takes a long time. That’s why it doesn’t happen to people who break easily or have sharp edges or have to be carefully kept. Generally, by the time you are Real, most of your hair has been loved off, and your eyes drop out and you get loose in the joints and very shabby. But, these things don’t matter at all, because once you are Real you can’t be ugly, except to people who just don’t understand.”

*From The Velveteen Rabbit*  
*By Margery Williams*

One thing is certain: some day, we are all going to die. Our bodies, although marvellous in their complexity, are nonetheless mere biological machines. And, like any machine, our parts wear out, break down and fall off, until — like the *Skin Horse* — we become very shabby, and our seams begin showing in all the wrong places. It's all part of becoming Real.

But, what is it that prescribes the course of one's life? Why is it that one individual will succumb to cancer in their 30s or 40s, while another will live — disease free and healthy — for more than a century?

Is it blind chance — a fatalistic roll of the dice — that determines the length of one's worldly presence? Could it be the unalterable rhythm of a slow-dance, long ago choreographed into our very being? Then again, perhaps the timing of our *becoming* is the inevitable consequence of the bumps, bruises and lifestyle choices made along the way.

Acknowledging our mortality does not discount the belief of a spiritual dimension to life that transcends such limitations. It does, however, raise some fundamental questions about how long the human machine can be expected to endure. While the Holy Grail of longevity may never be found, modern science has discovered some intriguing clues to its presence.

Over the past 50 years, advances in molecular biology have unravelled many of the mysteries of the cell, the basic unit of all life. To understand how the machinery of the cell operates, how it wears out and how the eventual breakdown of cells, tissues and organs impacts the health of the entire organism, is to begin to understand the aging process, itself.

Dr. Thomas Perls, assistant professor of geriatrics at Harvard School of Medicine, has recently blazed a very wide trail into this scientific frontier. Dr. Perls studies centenarians, people who have lived to be over one hundred years of age. Perls became fascinated by the extremely old while working at the Hebrew Rehabilitation Centre in Boston. Like other physicians at the time, he assumed that his centenarian patients would be the sickest. In fact, he had trouble tracking them down, as they were never in their rooms. They were active, engaged and enjoying life to the fullest, playing piano, visiting others or mending a friend's favourite blouse.

To his astonishment, Perls discovered that his centenarian patients were far healthier than anyone ever imagined. Most were able to avoid the most devastating diseases until the last few years of their life. Nine years of further study with over 1500 centenarians led him to some fascinating insights about the very old.

According to the data compiled by Perls, longevity has a familial characteristic, one that points to a strong genetic influence. His initial research revealed that a person who had a centenarian as a sibling was significantly more likely than the average person to live to a very old age. Later analysis showed that male siblings of centenarians are 17 times as likely as the average person to live to 100, while female siblings were 8 times as likely.

There is convincing evidence that centenarians carry a small handful of genes that promote longevity. The gene sequences appear to reside on chromosomes 2 and 4, two of the 23 pairs of chromosomes present in the human genotype. A genetic basis for longevity may also help explain why some centenarians were able to reach the century mark *despite* a lifetime of smoking and consuming high fat foods. Perls suggests that it is these fortunate few who have some really spectacular genetic stuff going on.

While genetics appears to play a significant role in determining one's longevity, good genes alone won't necessarily keep people alive to celebrate their one-hundredth birthday. The data show that lifestyle plays an important role, as well.

With the few exceptions noted above, most centenarians in the study never smoked, few drank to excess, and obesity was never a part of the picture. Of particular note was the fact that all are exceptionally adept at managing stress and getting along with others. Full of humour, centenarians as a group are gregarious, optimistic people. Amongst this elite fellowship, there are 5 times as many women as men.

Perls' findings, supported by other studies, suggest that genetics and lifestyle both play central roles in determining longevity. The mutual influence of these two factors on the aging process suggests a common mechanism of control.

According to Perls, the genes controlling the aging process appear to operate by limiting the activity of free radicals in the body. Free radicals are charged molecular fragments with unpaired electrons, created through ongoing oxidative reactions in each of the body's trillions of cells. Like sparks from a spitting fire, which burn pin holes in your living room rug, free radicals can damage the delicate fabric of the cell. Free radical-induced oxidative damage is now thought to be the biochemical trigger for many degenerative diseases and a primary contributor to the acceleration of the aging process.

Previous studies on laboratory animals suggest that certain genes may shield the cell against free radical damage to prolong the lifespan of the organism. These findings, in turn, suggest that the genetic characteristic for longevity may be expressed through the mitigation of free radical-induced oxidative damage at the cellular level.

Similarly, lifestyle choices, including smoking cessation, avoidance of the consumption of alcohol and high-fat foods, and the increased consumption of fresh fruits and vegetables, have also been found to increase the body's defence against uncontrolled oxidative stress. Smoking, alcohol and excess dietary fat are potent free radical generators; eliminating these negative lifestyle factors markedly reduces the level of free radical production in the body.

In addition, diets high in plant-based nutrients (phytonutrients), particularly when combined with nutritional supplementation, boost the body's biological stores of antioxidants, Mother Nature's free radical freedom fighters. Antioxidants work together to quench damaging free radical activity within the cells of the body. Preventing free radical-induced oxidative damage is now recognized as a fundamental preventive measure in the war against degenerative disease and aging. In this regard, a recent study reported in the *Journal of the American Geriatrics Society* found that centenarians had substantially higher levels of antioxidants and lower levels of free radicals in their blood, than people 20 to 30 years younger.

The continuing work of Perls and others will, hopefully, shed further light on the link between lifestyle, genetic profile and the aging process — a link that involves the inevitable consequences of oxidative stress. What we do know is that longevity can be influenced by minimizing oxidative stress, through genetic influence and lifestyle modification (including behavioural change). While there is nothing you can do to roll the dice in your favour genetically (that die was cast before your birth), there is much you can do to promote longevity through positive lifestyle modification and dietary change.

With healthy lifestyle choices, a little common sense and an ounce or two of prevention, we may not add a *lot* of years to our lives, but we just may add a lot of *good* years to those that we are given.

Like the *Velveteen Rabbit*, one day we'll all become a little shabby and loose in the joints. But, don't despair; that's when you'll know you're Real!

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