

Phytonutrients, Lifelong Wellness, and the Theories of Aging

An ever expanding cornucopia of research exists that demonstrates that a diet high in fruits and vegetables significantly reduces the risk of many, if not all, the so called "common diseases of aging".¹

Although expert lists may differ, the more serious common diseases of aging certainly include dementia; ARMD and cataract; stroke, heart disease, and atherosclerosis; emphysema, pneumonia and COPD; cancer; diabetes; osteoporosis and osteoarthritis.

Some Common Theories of Aging

The theories as to why we age are numerous and constantly evolving, a few of which follow.²

1.) Catastrophic Accumulated Damage Resulting in Error Theories.

- The Free Radical Theory: Accumulated damage caused by *oxygen radicals* slowly "burns" cells eventually causing cells, tissues, organs and related systems to stop functioning.
- Accumulation of DNA Damage Theory: Damage to DNA mechanisms that synthesize proteins results in faulty proteins which accumulate to a level that causes "catastrophic" damage to cells, tissues, and organs. The high *oxidant* exposure of *mitochondrial* DNA, and its poor ability to repair itself as compared to nuclear DNA, is thought to make it most susceptible to such accumulated damage. Mitochondrial damage would also lead to a loss of energy.
- Somatic Mutation. Genetic mutations accumulate with age, causing cells to deteriorate and malfunction. *Oxidizing* radiations are major cause of such mutations.
- Rate of Living. The greater the rate of oxygen basal metabolism, and therefore the greater internal *oxidative* stress, the shorter the life span.

It should be noted that the main reason postulated for DNA damage, somatic mutation, and rate of living theories is related to *oxidation* and the Free Radical Theory.

- Cross-linking Theory. An accumulation of insoluble and "cross-linked" proteins damages cells and tissues. Skin wrinkling, secondary to *oxidizing* radiation from the sun's UV rays, is an example. **Advanced glycated end-products** (AGEs) are related to micro-circulation cross-linking errors. AGEs are an offshoot of a reaction occurring between a sugar and a free amino acid. In diabetes accelerated cross-linking in capillaries leads to retinopathy, nephropathy, neuropathy.

2) "Inflamm-aging" Theory

- Inflammatory Theory: A global reduction in the capacity to cope with immune stressors, a weakening of related enzymes systems, and a concomitant progressive

increase in pro-inflammatory status, are major characteristics of the aging process. This phenomenon is thought to be provoked by decades of continuous antigenic load and stress.

3) Pre-Programmed Theories

These are “built-in” breakdown theories. Aging is a direct consequence of genetic programming. The causes for aging are directly built into the genome and cellular structure, as a sort of molecular clock.

- Programmed Senescence. Experiments have shown that human cells will divide less than 100 times outside the body. Also, there is an inverse correlation between the number of cell divisions and the age of the person from which the cells were taken. Aging is therefore *predetermined* in the genome. The related **Telemere theory** suggests that cell death is caused by the shortening of telomeres, which are "caps" on the ends of chromosomes. When the telomeres get too short, the cell stops replicating and so it dies off (apoptosis), which eventually leads to the demise of the entire organism.
- Endocrine Theory. Biological clocks act through hormones to control the pace of aging. Aging is associated with the *somatopause, andropause and menopause* and the lowering of the so called "hormones of youth", including the sex hormones.
- Immunological Theory. A programmed decline in immune system functions, and involution of the thymus, leads to an increased vulnerability to infectious disease and thus aging and death.

Phytonutrients and the Common Theories of Aging

*"... diets rich in phytochemicals provide protection from vascular diseases and many cancers (thru) direct antioxidant activity as well as modulation of enzyme expression or hormone activity...the total dietary load of phytochemicals may have important implications for health."*³

Phyto-nutrients are a class of chemicals found in plants, i.e., phytochemicals. Despite the name, phytonutrients are generally not nutrients as such, but nonetheless have the potential to favorably modulate human metabolism in multiple ways.

Phytochemicals can be grouped into families based on their chemical structure and biological activity. ⁴ As such, phytonutrients can be classified as terpenes, phenols, polysaccharides, organic acids, organo-sulfurs, amines, and certain lipid eicosanoids. These can be further sub-classified. For example, the terpenes include the carotenoids, chromanols, saponins, and limonoids; the phenols include the flavonoids, OPC's, catechins and so on. Understandably, the US government has tried to keep it simple by recommending we all just eat lots of fruits and vegetables of *all* the colors!

Today, numerous researchers world wide are endeavoring to investigate and confirm possible functional properties in foods, phytonutrient or otherwise, beyond the more familiar vitamins and minerals, that could be efficient in preventing the common diseases of aging like macular degeneration, heart disease, atherosclerosis, diabetes, dementia, and cancer.

A small example of such research on phytonutrients suggest that individual phytonutrients can:⁵⁻¹⁷

- serve as powerful, tissue specific, water and fat soluble antioxidants (*organic acids, flavonoids, proanthocyanins, catechins, carotenoids, tocopherols*)
- help repair DNA damage (*the polyphenols resveratrol, quercitin, rutin, catechin; chlorella amines and CGF*)
- inhibit mutation (*carotenoids, especially lycopene*)
- lower glycemic load (*polysaccharide soluble fibers*)
- enhance insulin sensitivity (*organic acids from cinnamon*)
- modulate inflammatory functions (*omega 3 fatty acid eicosanoids, quercitin and catechins, amine plant enzymes*)
- promote life extension (*resveratrol*)
- modify cellular receptor uptake of hormones, (*phyto-estrogen phenol isoflavones*)
- detoxify carcinogens through the activation of the cytochrome P450 and Phase II liver enzyme systems, (*the organo-sulfurs sulforaphane and indole-3-carbinol*)
- cause cell death, also known as apoptosis, in cancer cells, (*carotenoids, catechins, organo-sulfurs*)
- enhance resistance and immune responses, (*cranberry and raspberry organic acids, pre-vitamin A carotenoids*)
- modulates angiotensin I converting enzyme to help lower blood pressure, (*proanthocyanins , catechins*)

Conclusion : Functional Foods and Phytonutrients Against Chronic Diseases

Most authorities agree that the best nutritional foundation for life long wellness is from natural whole foods. They also agree that efforts to improve the quality of the Western diet have been mixed at best. In order to increase the nutrient density in the industrialized societies "functional food" products are increasingly promoted. Inclusion of *phytonutrients* in such functional foods is a common strategy.

The ever clearer take home message for those wishing to delay the onset of the “all too common” diseases of aging and promote lifelong wellness is that both our dietary and supplementation habits would do well to include a wide variety of whole plant foods and whole food supplements nutrient dense in a balanced, broad, full color spectrum of phytonutrients.

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