Nutrition: The Anti-Aging Factor

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Due to increasing gains in life expectancy, by 2025 the number of people aged sixty-five and over will comprise 29 percent of the U.S. population. As a consequence of aging, the typical chronic diseases of the body and brain such as cardiovascular disease, cancer, hypertension, and Alzheimer's disease (AD) will claim more and more precious human resources. To pursue good health as we age becomes more and more important in order to enjoy a disease-free and rewarding quality of life during our later decades.[1]

From the moment of our birth we begin to age. Aging can generally be defined as a progressive decline in the efficiency of biochemical and physiological processes after the reproductive phase of life.[2] From one birthday to the next we are unaware of the fact that our cells, organs and bones are slowly losing some of their function. The common lament, "I am not as young as I used to be," has become reality for the Baby Boomer Generation as it grows older.

With the appearance of the first crow's feet, many men and women flock to cosmetic surgeons, anti-aging physician specialists, dietary supplements, and cosmetics counters to buy the newest anti-aging products, which are often laden with toxic chemicals. Americans spend millions on anti-aging therapies, according to Global Industry Analysts, which says that this spending will "push the U.S. market for antiaging products from about $80 billion now to more than $114 billion by 2015."[3] But the solution to feeling good and looking fit and healthy may not be so elusive or expensive, and in fact may be found only a few steps away—at your farmers' market or in your own garden.

THE PHYSIOLOGY OF AGING

Aging has been predetermined in our genes, experts say, and cells can only divide forty to sixty times before they reach the "Hayflick Limit," a theory advanced in 1961 by Leonard Hayflick at the Wistar Institute in Philadelphia, Pennsylvania. Structures at the end of chromosomes called telomeres protect cells from deterioration or fusion with other chromosomes. After each new replication the telomeres shorten until they reach a critical length when they stop dividing, begin to "age" and ultimately die.[4] Scientific laboratories like SpectraCell now provide telomere testing as "a window into your cellular age."[5] DNA damage, exposure to toxins, irradiation, and activation of oncogenes (genetic material that carries the ability to induce cancer) also cause cell aging and death in healthy cells.[6]

On the other hand, a rare "genetic condition" called progeria—accelerated premature aging— can develop in infants and young children which is not actually genetic in nature yet appears through a "new" point mutation on a specific chromosome. These children quickly develop the typical symptoms of old age, such as hair loss, atherosclerosis, loss of eyesight, wrinkles and stiff joints, but the brain seems not to be affected and mental development is normal.[7]

An exception to the Hayflick limit is cancer cells, which appear to be immortal in their ability to continue reproducing. Because of a telomere-lengthening enzyme, mutation, viral infection, or production of chemicals such as the enzyme nagalase, which blocks the immune system from destroying them, they avoid normal programmed cell death (apoptosis).[8]

The most famous, oldest, and most commonly used immortal cell line, dubbed HeLa, originated in a tumor sample taken from an African-American woman, Henrietta Lacks, who is the subject of the recent book *The Immortal Life of Henrietta Lacks*.[9] The tumor cells, harvested at Johns Hopkins Hospital, gave rise to the eponymous HeLa cell line which researchers have used continuously since her death in 1951 for numerous experiments, including Jonas Salk's development of the polio vaccine. Contamination with human papillomavirus made them immortal.[10] Neither Henrietta Lacks nor her family received one penny from the millions of dollars made from her uninformed and involuntary cell donation. Researchers have grown and used around twenty tons of her cells and research relating to this cell line has generated seventy-six thousand abstracts on Pub Med.[11]

Cancer cells aside, probably the most important factor in aging and living long with a good quality of life is nutrition. What we eat supplies the building blocks for our body's cells, energy-producing mitochondria, enzymes, and co-factors that build or break the body. When a vital piece of this complex puzzle goes missing, the body scrambles to find substitute pieces. But the results may not look much like what nature intended. Disease and illness are the result.

The Standard American Diet (SAD) comprises a supermarket basket of industrially refined products whose packaging is sometimes more nutritious than the contents. Dominated by genetically modified corn and soy derivatives along with *trans* fats, refined and rancid vegetable oils, artificial colorings, flavorings, sweeteners, and high fructose corn syrup, the unpalatable and sickening ingredient list goes on and on. Coupled with pesticide-laden fruits and vegetables, suspicious animal products from factory and confinement operations, our standard commercial food supply is far from nutritious and is more likely dangerous. Fortunately there are many things that we can do to improve the quality of our meals and supply our bodies with the building blocks they need to function optimally all throughout life.[12]

AVOID SUGAR

Sugar has proved to be one of the most damaging substances to health and is a major factor in premature aging. Fructose in particular is an extremely potent pro-inflammatory agent that accelerates aging.[13]

Since its introduction to the New World, sugar consumption has progressively increased from less than five pounds per year per individual in 1850 up to one hundred fifty pounds in 2003.[14] Between 1900 and 1967 the use of sugar more than doubled in the U.S. and U.K.[15] In 1970, an additional sugar source, high-fructose corn syrup, was introduced into the industrial food supply.[14]

Fructose, contained naturally in some fruits and in the form of high fructose corn syrup, is a part of the fructose load, which the body processes differently from glucose. The body uses glucose for fuel but stores fructose in the form of triglycerides. Sucrose (cane or beet sugar) is half glucose and half fructose.[16]

Sugar forms advanced glycation end products (AGEs) when it reacts with amino acids and fats, a process which can occur in food itself during cooking and also in metabolic reactions inside the body.[15] In cooking, the process is called the Maillard reaction, which gives breads and meats their browned, caramelized aroma and appearance. Searing meat and cooking at high heat form AGEs. Braising and stewing cuts of meat at lower temperatures and in "moist heat" environments in covered vessels are more healthful cooking methods because fewer AGEs are formed. AGEs are also responsible for colors and flavors in foods, such as in toasted bread, french fries, malt whiskey or beer, condensed milk, roasted coffee, caramel, chocolate syrup, and others.[17] Pressure cooking can also contribute to the formation of AGEs because of the high temperatures generated during cooking.[18]

Glucose is the least reactive form of sugar and forms many fewer AGEs than fructose. In diabetic patients the concentration of fructose often surpasses that of glucose in the lens of the eye, causing cataract growth and blindness, and in nerves, causing neuropathies.[19]

Fructose is also a potent creator of AGEs that speed up the aging process.20 It does this in the conversion from fructose to fructose 1-phosphate, which drains the energy source, ATP, from the cells and promotes a dramatic inflammatory response.[21] Gary Taubes explains in his books, *Good Calories, Bad Calories* and *Why We Get Fat*, that it is fructose, not saturated fats, that contribute to high insulin levels and insulin resistance, promoting adipocyte formation around the liver and midsection, and increasing insulin and leptin levels, all factors associated with premature aging.22 In addition, fructose elevates blood cholesterol, uric acid, urea nitrogen and lactate production.[20]

AGEs cause inflammation, which promotes heart disease, Alzheimer's disease, diabetes, liver damage, and other chronic degenerative diseases. When receptors for AGEs bond with scar tissue in the endothelium of blood vessels, arterial plaques are formed. Collagen, the lens of the eye (cataracts), myelin, and DNA also accumulate AGEs. Glycation can be determined by a test for hemoglobin A1c, which is a marker of long-term blood sugar levels and how the body processes sugar.[20]

Fluoride has been added to community water supplies in the U.S. since the 1940s and continues to be a goal of the Public Health Service (PHS), which considers water fluoridation “one of the ten greatest achievements of the 20th century.” Yet for all this lip service to the victories of public health mandates, the PHS in fact has paid little attention to the *harmful* physical effects of fluoride on the human body. No government funds are available to explore the topic of fluoridation dangers. Existing research on fluoride’s insidious effects on the body comes from scientists in other countries such as India, where ground water contains extremely high amounts of fluoride and all want it out, not in. The Chinese government recently funded a series of studies on fluoride and IQ. [25,26]

Ingestion of fluoride induces adverse effects not only in teeth and bones, but also in various soft tissues such as brain, skeletal muscle, kidney and liver, and interferes with reproductive functions, such as the production of sperm. Fluoride is a powerful central nervous system toxin and adversely affects brain function even at low doses, and causes neuron death along with impaired memory and learning. Fluoride disturbs the antioxidant enzyme activities in the brain. Fluoride fed to rats caused DNA damage in their brain cells and epigenetic changes in the brain tissue of offspring of the exposed rats.[27]

In rats treated with sodium fluoride (NaF) (the pharmaceutical form of fluoride), administration of vitamin D significantly lessened the skeletal and visceral abnormalities of skeletal fluorosis. Altered serum enzyme activities and lipids in the livers of male rats with fluorosis recovered to normal levels when the rats were given selenium. By improving mitochondrial membrane stability, selenium (Se) protected skeletal muscle cells damaged by fluoride through a disruption of energy metabolism in the mitochondria. [27]

A recent Indian study showed that rats treated with NaF showed significantly enhanced activity of the pro-oxidants xanthine oxidase and lipid peroxidation, and decreased activity of the antioxidants catalase, superoxide dimutase, glutathione- s-tranferase, glutathione perioxidase, and glutathione reductase. Supplementation of

Se along with NaF reversed the pro- and antioxidant systems towards normal levels. Selenium also increased general fluoride excretion. The accumulation of fluoride in the mouse brain was significantly less in mice treated with Se.[27]

Selenium is a necessary trace mineral in human nutrition and a potent antioxidant. The major biological form of Se is found in the amino acid selenocysteine. It is toxic in high doses. As a co-factor, it is required for the activity of a number of selenoenzymes involved in the stress response and in the maintenance of high tissue antioxidant levels.

Selenium acts nutritionally through its various selenoproteins to control the level of cellular hydroperoxides and the redox tone of the cell. Hydroperoxides can damage protein and cell organelles involved in the regulation and control of the body's antioxidant glutathione peroxidase system, which plays a major role in the control of reactive oxygen species (ROS).[28]

Selenium appears to be an anti-aging nutrient in that it protects humans from the pro-oxidant effects of fluorides on the brain and body. Selenium is found in fish, shellfish, Brazil nuts, organ meats, poultry, dairy, onions, and in supplements of seleno-methionine. Supplements containing selenites are not useful and may be harmful.[28]

One of the most memorable fluoride researchers of all time was Dr. John Yiamouyiannis, a biochemist, researcher, and the editor of *Chemical Abstracts Service*, the world's largest information center on chemicals. Dr. Yiamouyiannis demonstrated that fluoride caused cancer and that mortality rates were significantly higher in fluoridated communities. In 1993 he wrote in *Fluoride: The Aging Factor* that fluoride caused premature skin wrinkling through its effect on the breakdown and irregular formation of collagen in the skin, along with weakened tendons, ligaments, muscles, cartilage and bones, causing cases of irreversible arthritis. By studying populations in Turkey, India, and Italy where natural fluoride in the water is high, he saw the effects of crippling skeletal fluorosis.[29]

He revealed in his book that by 1981, scientists knew that fluoride inhibited enzymes by binding to their co-factors, such as magnesium and phosphate. At one part per million (ppm) fluoride changes the bonds holding the protein in place, disrupting the enzyme shape and activity and setting off an autoimmune reaction, with possible effects on the DNA molecule itself.[29] The U.S. government claims that fluoridation at four parts per million is not harmful.[25]

Fluoride also blocks the migration of white blood cells to the site of infection in the body, damaging the immune system's ability to destroy pathogens. Researchers discovered that fluoride perturbed the white blood cells' components and function by stimulating their production of superoxide when at rest, thus releasing superoxides into the blood stream, damaging tissues and depleting energy reserves, processes associated with accelerated aging. Further, in the presence of infection, fluoride *inhibited* the cells' production of superoxides— compounds that the cells normally employ against the challenge of a pathogen— thereby crippling white blood cells' healthy response.[29]

Back in 1932 the dentist Dr. Weston Price reported a general disturbance of mineral metabolism and decreasing blood levels of iron, calcium, phosphorus, and potassium by fluorides. He wrote about his findings in the paper "Evidence of a need for fluorine in optimum amounts for plants and animal growth, and bone and tooth development with thresholds for injury."[26]

To avoid fluoride's detrimental effects on the body, avoid fluoridated water, and products made from it, such as soft drinks, beers, tea mixes, energy drinks, fruit juice mixes, and especially those products packaged in aluminum cans. Baby formula should never be mixed with fluoridated tap water. Mother's milk is the beverage of choice for infants.[25]

If you live in an area where the community waters are fluoridated, a reverse osmosis system will remove it from your water. However, exposure to fluoride occurs not only through drinking and cooking, but also through bathing, showering, and watering the garden. Many vegetables and fruits are sprayed with a fluoride spray for storage and grown with fertilizers that contain fluoride.[29]

Fluoride occurs naturally in the soil and tea plants (*Camellia sinensis*) have a natural affinity for it—they take it up into their roots. Soils in parts of India, Turkey, and China, where most tea is grown, have high amounts of fluoride in the soil. Some tea is also sprayed with fluoride-containing pesticides. Especially high in fluoride is instant tea. Organic teas have somewhat lower fluoride content. Grapes and grape products such as raisins and wines are high in fluoride.[25-26,29] People living near industrial areas with steel, fertilizer, aluminum, clay, glass, enamel and other manufacturing industries are exposed to high levels of fluorides in the air.[29]

FREE RADICAL THEORY OF AGING

Cells cannot live without oxygen, yet oxygen is the very source of free radicals that endanger the cells' existence. The body uses molecular oxygen to produce energy via oxidative phosphorylation in the mitochondria. This energy production and other metabolic reactions generate free radicals which cause a condition called oxidative stress. This cellular damage affects proteins and DNA replication, and inhibits repair through many complex processes, including telomere shortening in the DNA components.[30-31]

Denham Harman, MD, PhD, the "father" of the free radical theory of aging, first proposed his hypothesis in 1965. Today it is the most widely accepted theory used to explain the aging process. Harman claimed that aging is the result of oxidative stress due to reactive oxygen species (ROS)—also called free radicals—generated by a multitude of endogenous and environmental processes. They are highly reactive molecules that can directly damage the structures of cells and their lipids and proteins, as well as DNA. Other cellular sources of superoxide radicals include xanthine oxidase activity which forms the superoxide anion followed by the generation of hydrogen peroxide. Neutrophils, eosinophils, and macrophages are also sources of cellular ROS.[32]

In the body, free radicals are produced in the mitochondria during detoxification reactions (cytochrome 450), in peroxisomes, and during inflammation. ROS can be produced from outside sources such as xenobiotics, chlorinated compounds, fluorides, environmental agents, metals, ions and radiation.[30]

The body possesses multiple endogenous defense mechanisms to protect it from ROS by weakening and destroying those substances. These mechanisms take the form of antioxidant enzymes (superoxide dismutase, catalase, glutathione peroxidase, glutathione-S-transferase) and the non-enzymatic antioxidant molecules (vitamin E, vitamin C, vitamin A, ubiquinone and others), which include the sulfur-containing antioxidants (glutathione, theoredoxin, alpha lipoic acids), melatonin, carotenoids, flavonoids, and polyphenols. The best dietary choice to fight aging is first and foremost avoidance of industrial fats and oils, which are just loaded with free radicals. Use butter, cook in saturated fats, and make your own salad dressing with olive oil.

Next, include foods and botanicals that contain multiples of anti-oxidant nutrients: the anti-aging powerhouses of garlic, curcumin, herbs, blueberries, and so on, which contain potent free radical scavengers.[30]

Catalase is a very important enzyme which protects the cell from oxidative damage by ROS. It is involved in the quick conversion of hydrogen peroxide (H2O2), produced in many reactions, to water and oxygen. Hydrogen peroxide is produced as a potent antimicrobial agent in the immune response when cells are infected with a pathogen. It is also a byproduct of normal cellular respiration, and is formed from the superoxide anion by the action of superoxide dismutase. Fuel your catalase production by eating foods like meat which contains sulfur, iron and methionine. [32]

Catalase has one of the highest turnover rates for all enzymes: one molecule of catalase can convert approximately six million molecules of hydrogen peroxide to water and oxygen each minute.[62] Catalase deficiency has been implicated in diabetes type 2, and in schizophrenia, atherosclerosis and other chronic diseases.[32]

Despite the presence of the cell's antioxidant defense system to counteract oxidative damage from ROS, oxidative damage accumulates during the life cycle and has been implicated in aging and age-dependent diseases such as cardiovascular disease, cancer, neurodegenerative disorders and other chronic conditions. It becomes

extremely important to supply the body with building materials needed for enzyme and antioxidant production through diet and supplementation to lessen the processes that lead to aging.[30-32]

PROBIOTICS FOR HEALTHY GUT AGING

Aging is accompanied by lower levels of gastric acid, an increase in stomach pH, and delayed stomach emptying, all of which contribute to a shift toward gut dysbiosis and a loss of microbial diversity. A lifetime history of antibiotic use destroys healthy colonies of probiotic bacteria and leads to increasing numbers of pathogenic bacteria, such as *Clostridium difficile* (*C. diff*), especially in those receiving antibiotic therapy. Studies show 21 percent of hospitalized patients with *C. diff* infections compared to 1.6 percent in the community at large.

The most important characteristic of age-related gut dysbiosis is the decline in the abundance, diversity and adhesive properties of *Bifidobacterium* species, which have important anti-infective and immunomodulatory functions. Lower levels are associated with an increased susceptibility to gastrointestinal and systemic infections as well as inflammatory conditions. This status leads to a decline in immunological function accompanied by an increase in inflammation, called “inflamm-aging,” a characteristic of many chronic diseases such as cardiovascular disease, Alzheimer’s disease, type 2 diabetes, osteoporosis and cancer. Aging is also accompanied by a decrease in innate as well as adaptive immunity, termed “immunosenescence,” which relates to an increased susceptibility to infections and autoimmunity.

One of the most important strategies to healthful aging and long life is to maintain a healthy immune system via the gut. Centenarians studied have healthy immune factors and the portion of healthy *Bifidobacterium* species ranging from 53 to 87 percent compared to 40 percent found in healthy younger people.

“*Bifidobacterium* strains isolated from healthy centenarians have been shown to enhance both immune function and intestinal function in healthy mice following oral administration. These findings provide tantalizing evidence that healthy centenarians are characterized by a gastrointestinal microbiota containing more numerous, diverse

Bifidobacterium populations that possess more valuable immunomodulatory properties than are even present in younger healthy people. Other studies show that preserved immune function modulated by a balanced gut microbiota is a characteristic of healthy elderly people at any age."[40]

Centenarians and especially those over one hundred years of age are examples of those who have learned to age successfully and well. What factors contribute to that longevity? Some of the longest lived people come from the Bulgarian mountains near the Greek border where fermented milk products have a long tradition in the local diet. The bacterium that ferments milk to yogurt is known as *Lactobacillus bulgaricus* and researchers from around the world have come to Bulgaria to study the fermented milk. A typical Bulgarian centenarian eats yogurt three times a day, "sometimes with bread crumbs." In existing pockets of longevity in locations around the world, like the native peoples studied by Dr, Weston Price, these peoples continue to eat their native diets of mostly fresh and unprocessed foods, and are generally isolated from most of the worst influences of modern civilization. They enjoy lives of moderation, sleep well and walk and work outdoors. They benefit from sunny, pollution-free, and oxygen-rich mountain living. [41]

THE AGING BRAIN

The brain also ages and neurodegenerative diseases such as Alzheimer's, Parkinson's and Huntington's, can be blamed on the processes of aging. Cerebral volume decreases and ventricles expand. Plasticity—the ability to change and function—decreases, as do the gray matter cells composed of neurons involved in senses, emotions, self-control, and muscle control, as do the memory parts of neurons, called dendritic spines.[42-44]

Increasing numbers of neurofibrillary tangles, accumulated tau proteins, and amyloid plaques are found in the brains of Alzheimer's disease (AD) patients. Recent theories have connected aluminum deposits in the brain to the formation of fibrillary tangles, the hallmark of AD. Aluminum is a neurotoxin involved in the development of AD. It is contained in vaccines, absorbed from aluminum cookware, and is an ingredient in antiperspirants, coated aspirin, and many over-the-counter medications. "Aluminum's

contribution to AD is based upon at least seven independently derived observations that at physiologically realistic concentrations, aluminum strongly promotes amyloid aggregation and accumulation, a key feature of AD neuropathology."[45-47]

Vitamin D is extremely important in the maintenance of a healthy brain and makes the antimicrobial peptide cathelicidin, which suppresses herpes simplex virus-1 (HSV-1) flareups, otherwise silent except for the appearance of cold sores. HSV-1 has been implicated in AD. The best source of vitamin D is the sun. As a fat-soluble vitamin, it is found in fat-based foods such as cod liver oil, pastured butter and lard from pastured pork. Vitamin D supplements are not always effective because they lack vitamin D's partners, vitamin A and vitamin K2, which work in tandem with vitamin D.[48]

A recent study found that melatonin protects neurons against the damage of AD.46 Melatonin is produced from serotonin in the pineal gland located in the inner brain. With aging, the pineal gland becomes calcified, thus less functional. But calcification has also been observed in young children. About 40 percent of Americans have calcified pineals by age seventeen.50 "Calcium, phosphorus and fluoride deposits increase with aging and are likely to cause decreased melatonin production and abnormal pineal function, which could contribute to a variety of effects in humans."[51] Upon examination in many studies, the pineal gland had the highest fluoride concentrations in the body, higher than bone or teeth.[52] This contributes to accelerated sexual maturation in females.[53]

Cognitive impairment is related to ROS. Inflammation is the most controllable risk factor in oxidative stress.[54] Antioxidants like fat-soluble vitamins A, D, E, and K, as well as B and C vitamins, and omega-3 fatty acids, are recommended to reduce oxidative stress.[23]

Neurotransmitters like serotonin and their receptors change with aging.[54] Dopamine synthesis declines as well as the number of dopamine receptors. DNA damage accumulates with age in the brain.[55-56] Saturated fats and fats from cod liver oil are extremely helpful in regulating the oxidative stress in the brain as we age.

IN CONCLUSION

Although there are many other nutritional giants that could be included in your arsenal, they cannot all be discussed here. Overall, the basic advice that we learned as children to "eat a variety of foods from many colors" still applies. Of course man cannot live on fruits and vegetables alone. Saturated fats, especially those from pastured animals and poultry, are most important in the diet to promote a happy, healthy brain and body. Follow the principles of the Weston A. Price Foundation diet which includes generous amounts of vitamins, minerals, trace minerals, good fats, high quality proteins, and probiotic foods flavored with unprocessed sea salt.[59-61]

Avoid industrial fats and oils, processed foods, refined sweeteners and fluoridated water.

In addition to good nutrition, other lifestyle practices such as those listed in the sidebar below all provide pieces to the puzzle that can help create a good life crowned with satisfaction, pleasure, health, and fulfillment as we age.[58]

SIDEBARS

YOU ARE ONLY AS YOUNG AS YOUR DETOXIFICATION SYSTEM

The body detoxifies chemicals and substances that occur naturally, such as alcohol, cigarette smoke, cholesterol, steroids, bile acids, and lipids, or those that are synthetic, such as drugs, food additives, agricultural chemicals, chemical products, parabens and phthalates, in a two-step balanced process called *biotransformation*, making them water-soluble to promote their elimination. In the liver, Phase I breaks down substances into substrates which then must go through Phase II to become water-soluble. A system of enzymes called cytochrome P450 (CYP), found in the liver, kidney, lungs and the brain do the job. However, things can go awry. Products produced in Phase I, such as reactive oxygen species (ROS) and toxic metabolites, are often more harmful than the original substances. The products of Phase I can also be delayed entering Phase II systems and can do local damage. Imbalances often occur with one phase becoming up-regulated or downregulated depending on nutrition, genetics and toxicities. Both phases are fueled by specific nutrients, and if these are

not supplied by diet, the pathways may not function correctly. There are thousands of mutations in the CYP genes that can affect the efficiency of the detoxification enzymes.

Certain foods promote detoxification or imbalances in detoxification pathways. Diets low in protein increase pesticide toxicity because certain detoxification mechanisms are dependent upon adequate amino acids. Foods like onions, garlic, cruciferous and green leafy vegetables, citrus, gingko biloba, grape seeds, green tea and curcumin "act in a complex, highly beneficial manner to improve balance in detoxification capability."45 In Phase II activity adequate amounts of glycine, glutamine, methionine, cysteine, N-acetylcysteine, sulfur, selenium, and taurine are very important to support activity. These proteins are found in pastured meat and eggs. Lipoic acid is an effective inducer of Phase II enzymes and supplementation enhances the level of glutathione synthesis when sulfur is adequate. Alpha lipoic acid is found in spinach, broccoli, yams, tomatoes, carrots and beets. Red meat, particularly organic meats, are good sources of this nutrient.[23]

In older rats compared to young rats, cellular oxygen uptake is lower and lipid peroxide levels higher. Age-induced oxidative damage caused deformities in the ability of key enzymes to bind to their substrate components. Scientists were successful in reversing mitochondrial decay in old rats by feeding them alpha lipoic acid and acetyl-carnitine in higher levels, which served to speed up the enzymes' ability to function as well as to increase cognition and improve heart rate.23 Animal-based foods such as beef, chicken, milk and cheese are good sources of acetyl-carnitine.[24]

STATIN, STATIN, ON THE WALL, THE DRUG MOST AGING OF THEM ALL

Senior citizens are targets for pill-pushing physicians; many become dumping grounds for drugs, taking up to ten or more per day, most of them unnecessary. Often seniors in decline will recover their health and energy simply by going off all their drugs.

By far the drugs that age us the most are the statin (cholesterol-lowering) drugs, prescribed today to almost all seniors, male and female alike. The side effects of statins read like a description of aging: sore muscles, back pain, shuffling gait, slowed reactions, type 2 diabetes, digestive problems, liver disease, depression, Parkinson's disease, mental confusion and memory loss. When patients complain about these side effects, their doctors usually brush off their concerns with the observation, "You're getting older, these are the normal signs of aging." But there is no need for seniors at any age to suffer from these symptoms.

Most seniors are unaware of the cruel irony—cholesterol lowering does not help you live longer. In fact lower cholesterol levels in the elderly are associated with increased rates of death from cancer, suicide, stroke and intestinal diseases. Several studies have shown that once past the age of sixty, the higher your cholesterol, the longer you live.

Seniors with all their mental faculties can just say no to cholesterol-lowering drugs. Those in long-term care facilities will receive cholesterol-lowering drugs as a routine unless family members make it very clear that they don't want them given—repeating the instruction every few months and checking the medication list to make sure their instructions are not forgotten.

For more information, see "Dangers of Statin Drugs," by Mary G. Enig, PhD and Sally Fallon at westonaprice.org.

CONSERVING THE DIGESTIVE FIRE

As we age, our digestive forces weaken. It becomes harder for the body to make hydrochloric acid (for digesting protein), bile (for digesting fats) and digestive enzymes (for digesting carbohydrates, proteins and fats). That means that seniors are often not getting the full benefit of their food, even if they are eating well and the food is nutritious.

Attention to the digestibility of foods is key to ensuring optimal nutrition for senior diets. Soups and stews made with nourishing bone broth are ideal, as bone broth greatly aids the digestive process. Vegetables should be well cooked. Salads may not be the best choice for seniors—soups serve them better, being easier to digest. Vegetable purées made with butter and cream are great comfort foods for seniors. Lacto-fermented foods with every meal will help ease the digestive burden.

Government warnings to the contrary, raw milk is a great food for senior citizens. It contains all the enzymes needed for full digestion and nutrient assimilation and represents a complete nutrition package. It is our best source of glutathione, the body's leading anti-oxidant. Fermented raw milk products, like yogurt and kefir, supply the digestive tract with beneficial bacteria, as well as digestive enzymes.

All grains should be properly prepared by soaking or sour leavening, for optimal digestion. Hard-to-digest grains like extruded breakfast cereals, granola, granola bars and muesli represent a difficult digestive burden for aging digestive tracts.

In addition to proper food preparation, supplements that can aid digestion include hydrochloric acid and ox bile; while the herbal preparation Swedish bitters aids in the digestive of protein and fatty foods.

The goal is not to live forever, but to ensure that all those years at the end are full of vigor and optimism. Making sure the diet is easy to digest will ensure that the "golden years" are truly filled with golden good health.

VITAMIN B_{12}: THE MOTHER OF ANTI-AGING SECRETS

Conventional medicine rarely associates falls, difficulty in walking, memory lapses, depression, dementia—all symptoms of aging—with B_{12} deficiency. However, studies closely link these behaviors with B_{12} deficiency. Between 15 and 40 percent of people over sixty have low serum B_{12} levels. Seniors are a high risk group for severe B_{12} deficiency for several reasons. Wasting of the stomach lining causes decreases in the levels of stomach acid, which is needed to liberate B_{12} from its protein host so that it can be absorbed. Unfortunately doctors treat the effects of this condition with protein

pump inhibitors like Zantac, Prilosec, Pepcid and other medications; these actually lower stomach acid even more. Because of this condition, people may not be able to break down the foods containing B_{12}. Unfortunately, B_{12} oral medications may not make any difference in blood levels. B_{12} injections of hydroxyl or methylcobalamin are often the most effective in raising B_{12} levels.

Low B_{12} levels at any age cause brain shrinkage and cognitive decline, even within the lower "normal range," resulting in inflammation of brain myelin. Bi-polar disorder and other mental illnesses may be a result of B_{12} deficiency, as well as other factors.

At risk for premature aging are vegans, vegetarians, and those who follow macrobiotic diets, because they avoid the very foods that contain substantial sources of B_{12}: meats and organ meats. B_{12} analogues found in such foods as spirulina or tempeh falsely raise B_{12} levels because they are not active in the body and may in fact increase the risk of B_{12} deficiency disease as these B_{12} analogues compete with true B_{12} at binding sites and inhibit metabolism. Vegan websites like veganhealth. org caution that no plants, including mushrooms, have real vitamin B_{12} activity. In these cases regular supplementation with B_{12} injections (hydroxycobalamin or methylcobalamin) are necessary to avoid premature aging. Unfortunately, pharmacy prepackaged B_{12} injectibles contain aluminum and parabens. It's best to get B_{12} injectible preparations from a compounding pharmacy and check with the pharmacist about excipients he may include. The doctor should specify "no preservatives" on the prescription.

B_{12} deficiency can actually start in infancy if mothers of breastfed babies have undiagnosed pernicious anemia, are vegan, celiac, or B_{12} deficient in any way. B_{12} deficiency can take the form of developmental delays and behavioral disorders in children. Young children with inadequate B_{12} levels can develop low IQ levels and mental retardation. Some antibiotics, birth control pills, antacids and other prescription drugs deplete bodily stores of B_{12}.[57]

AGING HAIR: THE SECRET LIFE OF THE HAIR FOLLICLE

Aging is a complex process involving various genetic, hormonal, and environmental mechanisms. With aging of the body often comes graying hair and decrease in hair production as a result of the decrease in melanocyte function and lower levels of the enzyme catalase. Oxidative stress may be the main mechanism contributing to hair graying and hair loss. Endogenous factors influence familial premature graying and androgenetic alopecia (hair loss). External factors include ultraviolet radiation (UVR), smoking, and nutrition.[31]

Hair color is determined by the presence or absence of melanin pigments. Skin and hair melanins are formed in cytoplasmic organelles called melanosomes, produced by the melanocytes, and are the product of a complex biochemical pathway (melanogenesis) with tyrosinase being the rate-limiting enzyme.[31]

Current theories say that hair graying is caused by the loss of the pigment-forming melanocytes in the hair follicle because of a decrease in activity of the tyrosinase enzyme and a reduction in a number of melanosomes. The free radical theory says that the activity of producing melanocytes is likely to generate ROS and if not neutralized, graying and hair loss will result. A recent study by Wood et al. demonstrated for the first time that human white scalp hair shafts accumulate hydrogen peroxide, a product of oxidation, with absent or very low levels of catalase and methionine sulfoxide reductase (MSR) protein. MSR is known to repair or damp down the effects of the free radical produced there, methionine sulfoxide (MS). MS produces residues in the active site of the key enzyme tyrosinase, which limits the melanogenesis process, leading to loss of hair color.[33-34]

Wood suggested that methionine oxidation may be prevented by supplementation with L-methionine, thus reversing or preventing hair graying. Methionine is an important amino acid found in meats.[34]

Studies indicate that lipid peroxides, which can cause free radicals, induce the cell death (apoptosis) of hair follicle cells in an inflammatory process which is gradual and initiated by several factors. Tobacco smoking has long been linked to premature aging

of the skin and is now associated with graying hair and hair loss. High doses of environmental cigarette smoke cause alopecia (bald patches) in mice, which was prevented by oral doses of L-cystine and vitamin B_6.[35]

For hair loss in women with androgenic hair loss, a 0.1 percent topical melatonin solution applied to the scalp once daily for six months led to significantly increased hair growth in occipital hair compared to placebo. For frontal hair loss in the group with diffuse alopecia, the melatonin solution gave a significant increase in hair growth. "The occipital hair samples of patients with diffuse alopecia and the frontal hair counts of those with androgenetic alopecia also showed an increase of anagen hair, but differences were not significant."[36] Anagen is the active growth phase of the hair follicles during which the root of the hair is dividing rapidly.

Melatonin is a potent antioxidant with anti-inflammatory effects in humans: it is a direct free radical scavenger and anti-aging factor made in the pineal gland, originating with the base amino acid tryptophan in four steps, with production of serotonin at the third step.[38]

There is a melatonin-producing system in the skin. In healthy human subjects, topical melatonin effectively prevented the development of redness and blistering in skin exposed to UV rays. In studies, the antioxidative effects of melatonin were superior to those exerted by vitamin C. "Topical melatonin would seem to represent the first topical 'antiaging' product for treatment of the aging scalp."[31] Melatonin is secreted into the blood during the dark period of sleep thus highlighting the importance of sleep. Sleep quality and duration will be affected with aging because melatonin production gradually decreases, and an exogenous source, via diet or supplements, may be desirable.[38] Melatonin is found in cherries, bananas, oranges, grapes, herbs (feverfew, St. John's wort), olive oil, wine, tomatoes and other fruits. Blood levels of melatonin significantly increase in humans consuming foods rich in melatonin.[37-38]

WAYS TO PROMOTE HEALTHY, HAPPY AGING

• First and foremost, avoid all industrial fats and oils, such as margarine, spreads, artificial whipped cream, commercial dips and cooking oils. Use butter liberally, cook with animal fats and use olive oil in salad dressings.
• Take it easy on the sweets, and use only natural sweeteners.
• Make sure foods are easy to digest, using bone broths and proper cooking techniques. Eat lacto-fermented foods daily.
• Raw whole milk can be a senior citizen's best friend; it is a full nutritional package that is very easy to digest.
• Avoid all pharmaceutical drugs, especially the cholesterol-lowering statin drugs.
• For healthy catalase production, favor foods with lots of healthy sulfur like eggs, garlic, and crucifers. Avoid food additives, artificial flavorings and sweeteners, and products made with them as they create oxidative stress in your body.
• Avoid genetically modified foods like corn, soy, cottonseed oil (in many snack foods), sugar beets, and papayas. GMO feeds cause rampant inflammation in the pigs and cancerous tumors in laboratory animals.
• Avoid fluoridated water by using reverse osmosis filtration or spring water, and don't ingest instant teas, conventional grape juice and wines, which all contain high levels of fluoride.
• Make it a pleasurable priority to search out organic, local and biodynamically grown fruits, vegetables, flowers and herbs. Even better, grow at least some of your own!
• Make sure you get plenty of fat-soluble vitamins from grass-fed butter and egg yolks, organ meats, fatty fish and cod liver oil.
• Exercise, walk, and maintain a happy, grateful mood during the day. Relaxation exercises and yoga lead to higher melatonin production.
• Eat only enough to satisfy hunger, savor your meals in relaxed surroundings with good company, and avoid excess calories and stress-related eating.
• Get enough good quality sleep regularly.
• Selenium, vitamin C ascorbates or natural vitamin C formulations, omega-3 fatty acids, and natural sources of vitamins E and K are great antioxidants.
• Pure water is healthful and delicious. Avoid diuretics such as coffee or tea, which flush out minerals.
• Maintaining an active social life and friendships is good for mental health.
• Intellectual and cultural activities such as attending opera or theater, reading and writing keep your mind young.

Additional Notes on the Topical Melatonin Solution

I don't know if this preparation is on the market in the US or if it is just experimental. There is no brand name given which makes me think that it is not. The participants applied a 1% melatonin–alcohol solution (melatonin, high-purified; Helsinn Chemicals,Biasca, Switzerland) or alcohol solution alone topically once daily in the evening for 6 months. The daily amount to be applied was 1 mL given in eight sprays. The alcohol solution alone was for the control group. Perhaps a compounding pharmacy could make this up for you. I would be careful about the source and type of alcohol. Food grade ethanol derived from a non-gmo grain- maybe a good vodka as used for tinctures– might work. Here in PA we can't get the 100% alcohol which is typically best for tinctures but in NJ. Another suggestion might be to consult with an herbalist. Also from my experience with compounders you might tell them "no preservatives."

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61. And all those wonderful authors out there who have added to our knowledge through their efforts to promote healthful aging through good lifestyle practices.

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About Sylvia Onusic

Sylvia P. Onusic, PhD, CNS, LDN, a board-certified and licensed nutritionist, writer and researcher, is a frequent contributor to the journal. Her background is in foods, nutrition, and public health. As "Your Public Health Advocate," she keeps you current on controversial topics in health and nutrition, analyzes studies in the field, and provides nutrition counseling services through her website at drsylviaonusic.com . Sylvia is the creator and director of “Taste of Slovenia: A Real Food Tour” at foodtourslovenia.wordpress.com and FaceBook: www.facebook.com/tasteofslovenia.