CAUSES OF SKIN AGING

Prepared by: Charlene DeHaven, MD, FACEP, Clinical Director

There are between 25 and 30 different theories of aging recognized by the NIH. Although some of these have much credible scientific support, they are still classed as “theories” because none have been irrevocably proven. There is no unified theory of aging. If there were, one ingredient in one skincare product would serve to treat aging skin. As it is, aging must be approached from the standpoint of multi-factorial causation with multiple ingredients and products. We are still learning about aging and how it affects the individual.

This article will discuss 4 key processes of aging. These processes apply to the entire organism and every cell within it. Of course, they also apply to skin. However, skin is unique in that is the organ that shields the interior of our body from the environment and all types of environmental assaults including solar damage, injury, pollution, and others.

Theory 1—Oxidative Stress

This theory is more commonly known as the free radical theory of aging. All cells need energy to perform their particular function. This energy is a very “hot” process and uses free radical generation to burn fuel. In this process, extra free radicals are created. These extra free radicals bounce around inside the cell, damaging all cellular structures they contact. Over a lifetime, these free radical “hits” gradually accumulate leading to a physiologic decline in structure and function. We label this decline “aging.”

Skin cells being metabolically active are subject to the same free radical damage as other cells of the body. In addition, skin cells are damaged by energy packets of solar rays termed photons. Photons are themselves very high-energy particles that are free radicals. Depending on whether the sunscreen chosen is physical or chemical, these solar free radicals can be blocked or neutralized.

Antioxidants are helpful because they combine with free radicals and prevent the ongoing cascade of free radical damage. Only about one percent of oral antioxidants reach the skin so topical antioxidants are also critical.

Suboptimal health states such as severe burns, diabetes, critical illnesses, infections, vascular diseases, endocrine diseases and others are associated with excess free radical generation. Smokers have huge amounts of free radicals floating about in their bodies.

All life forms must deal with free radical damage from internal metabolism and from the sun. It is not surprising that plant substances usually have some amount of antioxidant activity. Some plant substances such as Centella asiatica are especially potent antioxidants. The 3 most active components of C. asiatica are madecassic acid, asiatic acid and asiaticoside.

Theory 2—Inflammation

A certain amount of inflammation is required for health. Through its inflammatory response the body combats infections, clears away damaged tissue and heals sunburn and other oxidative processes. Excess inflammation results in accelerated rates of aging, scarring and destruction of normal tissue architecture.

Free radical damage is well-known to trigger excess inflammation. The inflammatory response is elevated

in those having higher levels of oxidative stress byproducts.

Oleuropein is an anti-inflammatory substance found in the olive tree, Olea europaea. More anti-inflammatory activity is contained within the olive leaf than in other parts such as olive oil.

Theory 3—Glycation

The process of attaching a sugar to a protein is called glycation. Oxidative damage is an intracellular process, i.e. occurs inside the cell whereas glycation is an extracellular process and occurs outside the cell. Glycation occurs in protein-rich tissues that contain large amounts of the protein collagen. Collagen-rich tissues include the skin, blood vessels, joints and lens of the eye. Glycated collagen is damaged collagen and less able to respond to physical stress by stretching. Glycated collagen has much less deformability and resilience.

Persons most subject to glycation have excess amounts of extracellular sugar (glucose). In this group are diabetics, the obese and the elderly. These 3 groups are all relatively "insulin resistant"; that is, they do not respond to insulin in a normal way by moving glucose inside the cell. The excess extracellular glycose will glycate collagen and damage tissues containing large amounts of it. This illustrates why "tight glycemic control" or keeping glucose at a normal level is so important in preventing the complications of diabetes. Excluding diabetics, before the age of 40, the level of obesity is most important in determining the rate of glycation. After age 40, chronological age is more important than the amount of obesity.

As we age, our ability to synthesize cellular products such as collagen decreases. This makes it more difficult for us to repair collagen damaged by glycation and other types of injury.

Resveratrol is an anti-aging substance found within red wine that prevents vascular disease. Resveratrol is found in the outer covering of the grape seed. Grape seed extract also contains resveratrol.

Theory 4—DNA Damage

DNA is contained in the helical structure inside chromosomes in the nucleus of the cell. This DNA contains our genetic material and also directs the function of the cell in which it resides. A cell with damaged DNA cannot properly function and may even become cancerous. Increased DNA damage in skin occurs with photoaging and high oxidative stress. Not as much DNA damage is found with glycation because DNA is protected from glycation within the cell. Most glycation occurs extracellularly.

Genetic defects such as Werner's Syndrome illustrate the importance of DNA repair. Werner's Syndrome is one of the progerias, the diseases manifesting greatly accelerated aging. Persons with Werner's Syndrome lack the helicase enzyme required for DNA repair. In the teen years, these individuals look much like everyone else. By the age of 30, they look many, many decades older and have an accompanying high rate of disease and decreased lifespan.

DNA is subject to free radical damage so antioxidants improve rates of DNA damage. Some growth factors such as EGF (Epidermal Growth Factor) or HGF (Hepatocyte Growth Factor) can direct the DNA of fibroblasts to synthesize more collagen.

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Improving Aging Rate and Surgical Outcome. Improving any of these 4 processes decreases the rate of aging and also improves surgical outcome. Individuals with excess free radical damage, glycation, inflammation or DNA damage have decreased healing capacity.

Certainly, attacking the processes of aging in younger years is preferable. But even though “younger is better”, any time is better than never. This is illustrated by experiments on rodents the equivalent of 60 in human years. These rodents, prior to their rodent age of 60, lived a life full of stress, free radical damage and high carbohydrate diets. At 60, they were put on high doses of antioxidants. Their lifespan significantly increased even at this late age. Similarly, when anticipating a procedure, “sooner is better” for instituting good skincare practices. If begun just prior to surgery, then 2-4 weeks is a good estimate of the minimum time required to begin a skincare regime.

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