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Causes of Aging

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Extrinsic Aging: Avoiding the Preventable

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Everyone's skin ages in its own unique way. Much of the inevitable part of facial aging is driven by a person's DNA and is considered intrinsic. Fortunately, 85 percent of the visible signs of aging can be directly attributed to extrinsic causes that are preventable, and can often be corrected, even if the damage has already been done. Making informed decisions about sun exposure, diet, exercise, smoking, and regular use of skin care products is key to staving off skin aging. Knowing the primary offenders and learning the best ways to protect you and your patients puts healthy, younger-looking skin within reach.



Facial Aging

One cause of the appearance of visible skin aging is a degradation of the skin's extracellular matrix (ECM). The ECM is a complex framework that supports and protects the cells of the dermis. A strong ECM must be present to shore up the skin's outer appearance and health. The ECM is made up of structural proteins (collagen and elastin), adhesive proteins (laminins and fibronectin), glycosaminoglycans (GAG), and proteoglycans. A network of collagen fibers gives strength and structure to the skin, while elastin fibers give the skin the ability to stretch and return to its original shape. The GAG that surround this structure are: Hyaluronic acid, heparin sulfate, chondroitin sulfate, heparin, and dermatan sulfate. Hyaluronic acid, the most extensively studied GAG, can hold up to 1,000 times its weight in water within the matrix, making skin healthy, plump, and youthful-looking.

Matrix metalloproteinase (MMP) enzymes are a main player in the breakdown of the ECM. MMP, such as collagenase, elastase, and hyaluronidase are responsible for the destruction of spent ECM components. Although a small amount of these enzymes are necessary for healthy skin, an over-production occurs in response to external damaging factors, predominantly UV exposure. Wrinkling, laxity, enlargement of pores, and loss of elasticity are exaggerated due to this ECM breakdown. More active melanogenesis and visible vascularity are also common as a direct result of UV exposure.

The Dark Side of the Sun

Unprotected sun exposure has been directly linked to collagen degradation, skin laxity, hyperpigmentation, and most importantly... skin cancer. UV radiation is particularly damaging to the skin because it has been shown to not only increase levels of reactive oxygen species (ROS), a particularly destructive free radical, but it also depletes the skin's own natural antioxidant defense system. This makes the skin vulnerable in many ways as a result of sun exposure.

It only takes one-tenth the amount of UV exposure to activate MMP enzymes as it takes to cause sunburn. This means that way before you think you have had any damage from the sun, you are already breaking down the critical support structure of the skin. Through time, pollution, and ultraviolet exposure, these MMP enzymes are slowly degrading the ECM.

The inflammation from UV exposure is also responsible for stimulating the melanogenesis process that leads to hyperpigmentation. This process causes melanin-containing melanosomes to be deposited in parasol-like configurations over the nucleus of each affected keratinocyte to protect its DNA from potential mutation. This mutation is what leads to skin cancer, which accounts for 50 percent of all cancers in the U.S.

An Ounce of Protection

To avoid the negative effects of sun exposure, it is critical to use broad-spectrum sun protection products on a daily basis, not just when participating in outdoor sports or activities. UVB rays do diminish slightly in the winter months, but UVA rays are constant throughout the year and penetrate through windows and clothing. This fact illustrates why year-round daily use of sun protection is the ultimate

in age defense. Using enough sunscreen is also important. Research states that an individual should use approximately one ounce of sunscreen to cover their entire body.

Antioxidant Defense System

To sufficiently protect skin from the damaging free radicals triggered by UV exposure, topical antioxidants should be added to every patient's regimen, in

addition to daily use of broad-spectrum sunscreen. Some useful UV protective antioxidants to include are:

Green Tea – Epigallocatechin gallate (EGCG) is a powerful polyphenol found in green tea that is responsible for much of its excellent antioxidant, anti-inflammatory, and cancer-prevention benefits. Research has shown that EGCG is able to reverse the immunosuppressive effects of UV rays, quench hydrogen peroxide radicals, and cause the destruction of skin cells that could potentially develop into tumors. EGCG has also been shown to inhibit lipid peroxidation and prevent the formation of nitric oxide, hydroxyl radicals, and singlet oxygen.

Resveratrol – Research has demonstrated that application of resveratrol prior to UVB exposure suppresses the production of hydrogen peroxide radicals and lipid peroxidation. Resveratrol also inhibits the activation of nuclear factor kappa B (NF- κ B), a protein complex that contributes to the formation of malignancies.

Genistein – This polyphenol is derived from soybeans and effectively increases the activity of the skin's natural antioxidant system. Genistein's ability to prevent lipid peroxidation and free radical production and its inhibition of cell mutation and DNA damage makes it an important part of any anti-aging regimen. Additionally, studies highlight genistein's ability to prevent both the short- and long-term effects of UV exposure, including erythema, skin cancer, and visible photoaging.

Ergothioneine – This antioxidant is relatively new to the skin care industry, but its antioxidant benefits and its ability to increase the protective action of traditional antioxidants such as L-ascorbic acid, make it an excellent addition to skin care products. Studies have shown that ergothioneine reduces several forms of free radicals, including hydrogen peroxide, hydroxyl radicals, singlet oxygen, peroxynitrite, lipid peroxides, and nitric oxides.



Caffeine – This ingredient is capable of reducing UV-induced free radicals, including hydroxyl radicals, hydrogen peroxide, peroxy radicals, and singlet oxygen. Research also indicates that topical application of caffeine can reduce UV-induced skin cancers by forcing damaged skin cells into apoptosis (cell suicide).

Silybin – Milk thistle-derived silybin is a powerful flavonoid antioxidant. Silybin inhibits lipid peroxidation and nitric oxide and hydrogen peroxide free radical production. It can also inhibit the immunosuppression and skin cancer caused by UV exposure, and decrease the cellular degradation caused by UV exposure.

Suffocating the Skin

In a study compiled by the Campaign for Tobacco-Free Kids in the fourth quarter of 2010, 46.6 million U.S. adults and 3.4 million high school students regularly smoke cigarettes. Even with much stronger policies on educating children about the dangers of smoking, 1,000 kids become regular smokers every day. The dangerous heart and lung diseases that are directly linked to smoking are widely known, but we do not have as strong of a dialogue about what smoking does to healthy skin. Smoking is a major contributor to many skin conditions and complications, such as skin discoloration, ECM breakdown, deep wrinkling, premature skin aging, poor wound healing, and the formation of abnormal skin growths.

The nicotine in cigarette smoke causes vasoconstriction (blood vessel contraction). Additionally, the carbon monoxide present in cigarettes bonds with oxygen in the blood, greatly reducing the amount available to the body. This deadly combination of nicotine and carbon monoxide creates a situation where there are not only constricted capillaries trying to carry the oxygen, but also less oxygen flow through them.

Smoking just one cigarette restricts blood flow for up to 90 minutes. This means there is a greatly reduced amount of oxygen passing through the skin. If a person smokes more than one cigarette in an hour and a half, then the time the skin goes without proper oxygenation is multiplied exponentially. Amazingly, once this restricted oxygen flow has persisted in the skin over time, the

body attempts to get more blood to the skin by producing more blood vessels. Eventually, this leads to the telangiectasias that are characteristic of a condition known as “smoker’s skin.” Exposure to the pollutants present in cigarettes accelerates the degradation of the ECM by increasing MMP (specifically MMP-1) activity, causing the unwanted breakdown of healthy and necessary matrix components. Smoking is an avoidable environmental pollutant that compromises health and ages the skin prematurely.

Breathing Life Back into the Skin

Once someone has quit smoking there are treatments and topical ingredients that will help improve the skin. Professional detoxifying and oxygenating procedures promote circulation and oxygenation of the skin cells, which can dramatically improve skin tone. Ingredients like L-ascorbic acid (vitamin C), retinoids (vitamin A), and certain peptides increase collagen deposition to strengthen the skin and minimize the wrinkling so common in smokers. Caper bud extract and some types of algae work to support and strengthen the capillaries and reduce their hyperpermeability (leakiness). Matrix metalloproteinase-inhibiting ingredients (MMPi) like resveratrol, soy proteins, epigallocatechin gallate (EGCG), sodium chondroitin sulfate, and L-ascorbic acid work to protect the ECM from the damaging effects of excess MMP activity. Superficial chemical peel treatments improve the overall health and appearance of the skin, reduce fine lines and

wrinkles, and greatly improve skin surface texture. There are many additional options available; however, nothing can replace the necessary oxygen for continued skin cell health better than simply quitting smoking.

Healthy Skin for All

Although every individual is a product of their heredity, and some types of facial aging are inevitable, the vast majority are preventable, avoidable, and correctable. Well-educated patients are more likely to be compliant with your directions for daily broad-spectrum sun protection use, antioxidant supplementation, and the avoidance of negative lifestyle choices like smoking. This then gives you the opportunity to help all your patients achieve all their healthy skin goals.



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