

Natural ingredients for anti-ageing skin care

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ABSTRACT: The expanding range of natural actives in mainstream cosmetic products that support healthy skin aging, is ample proof that the industry now relies heavily on these ingredients. Recent scientific evidence has served to strengthen the concept of phytonutrients and validate their efficacy at the molecular level in keratinous tissues. These findings, along with successful clinical studies, have helped to establish the healthful role of dietary components, phytoactives and foods ingredients, in supporting beauty from within, in the form of nutricosmetics, and from the outside, as cosmeceuticals. This article reviews the scientific validation of the healthful role of some such actives in skin health, and their applications in anti-ageing compositions.

INTRODUCTION

Natural ingredients in the form of phytonutrients, microbial metabolites, dairy derived actives, mineral nutrients, and animal protein components have long been believed to benefit healthy skin ageing. Recent scientific evidence has served to strengthen this concept and validate the efficacy of several natural actives at the molecular level in keratinous tissues. These findings, along with successful clinical studies, have helped to establish the healthful role of dietary components, for example, in supporting beauty from within, in the form of nutricosmetics, and from the outside, as cosmeceuticals. The expanding range of natural actives in mainstream cosmetic products is ample proof that the industry now relies heavily on these ingredients. The demand for cosmeceutical products is expected to increase to more than \$8 billion by 2010. The global cosmeceuticals market, initially dominated by acne therapies such as retinoids, and skin lightening agents such as hydroquinone, experienced a quantum shift to the anti-ageing sector, and more specifically to natural anti-ageing actives, in the last decade. Innovative naturals have entered the cosmeceuticals arena and found their way into well known, branded cosmetic compositions. Skin care products are forecasted to account for more than 60 percent of the total cosmeceutical product demand in 2010, and the demand for anti-ageing products is growing at twice the rate of other cosmeceutical products (1).

ANTIOXIDANTS AND BEYOND

Ageing in mammals is characterized by senescence, a decline in physiological functions resulting from cumulative damage to

tissues that overwhelms the body's natural ability to repair them. Skin ageing manifests as age spots, more specifically as melasma, dyschromia, melanomas, and wrinkling, mainly attributed to free radical damage to the tissues that triggers cross linking and glycation of structural proteins, and pro-inflammatory enzyme systems.

Natural antioxidants that quench free radicals are an essential component of anti-ageing formulations. They potentially offer protection against damage to the tissues, and against the detrimental effects of environmental and other agents. Biochemical reactions that accelerate the progression of skin ageing have their roots in inflammatory processes, as inflammation generates micro-scars that develop into blemishes or wrinkles. Various types of inflammatory mediators may influence melanin synthesis by affecting the proliferation and functioning of melanocytes, pigment-producing skin cells, and normal cutaneous blood circulation. Natural "anti-inflammatory" agents are therefore included in anti-ageing formulations in order to soothe, heal and protect skin tone and integrity. Polyphenols from sources such as green tea, turmeric, red wine (resveratrol), grapes (anthocyanins), grape seed (proanthocyanins), Indian gooseberry (gallotannins), have been scientifically proven to support skin integrity and tone.



BETTER THAN BOTOX?

Delivery systems and extraction processes for natural actives are advancing rapidly to enable the seamless inclusion of these actives into cosmetic and functional food formulations that benefit skin health. Technological innovations in cosmeceuticals are fine tuned to offer appearance-enhancing benefits for the increasing ageing population. Such cosmeceutical interventions are noninvasive, and safe, unlike surgical procedures, including Botox injections. Significant alternative approaches to invasive procedures include pentapeptides (based on essential amino acids), stem cells derived from vegetable and animal sources, and innovative micronized natural actives in the form of nanosomes and nano-dispersions. Natural peptides are innovative cosmetic ingredients that can be potentially used to counteract wrinkles formation and loss of elasticity. For example, hydrolyzed milk proteins are marketed for this purpose, and the traditional use of dairy products, in various cultures, to enhance skin tone and prevent the appearance of wrinkles, further validates their use in anti-ageing formulations. Peptides derived from nut meats (such as almonds), and legumes, are other examples.

HYDRATION IS KEY

Hydration is important to preserve skin integrity and tone. In general, unsaturated fatty acids reinforce the skin's barrier function, prevent moisture loss through the epidermis, provide structural integrity to the skin damaged by external influences and are anti-inflammatory.

They also help to soften and smoothen the skin by inhibiting the formation of corneous cells.

Lipid compounds that provide an occlusive effect to prevent water loss, repair lipid layers and restore barrier functions are therefore an integral part of anti-ageing formulations.

Natural topical moisturizers that nourish and tone the skin represent another innovative application of natural extractives in personal care products. One example is Coriander seed oil, a rich source of petroselinic acid, linoleic acid and related fatty acids. These fatty acids are constituents of ceramides that are inherently present in the stratum corneum and prevent moisture loss from the skin surface.

Polysaccharides (such as chitosan and derivatives), low molecular weight glycans (tamarind seed polysaccharides, for example), that prevent water loss from the skin, tissue components (such as hyaluronic acid and complexes) and other actives are popular as natural moisturizers.

Fats such as shea butter, cocoa butter and coconut oil derivatives, are other naturals that support skin texture and hydration.

Fruit based ingredients such as green coconut water, rich in nutrients, amino acids (including arginine, a urea precursor, and growth factors, also support hydration and preserve skin elasticity. The results of a clinical study showed that treatment with a cream containing Cococin™, a patented coconut water solids composition, significantly improved skin elasticity, which was manifested in decreased skin roughness and improved skin tone. Thus coconut water solids nurture keratinous tissue, and support tissue integrity, thereby potentially

inhibiting the appearance of the signs of ageing and the manifestation of wrinkles (2, 3). Such ingredients can effectively be used for oral and topical applications and serve as a natural pool of nutrients and growth factors that support healthy ageing.

Another class of natural actives that support skin hydration are the natural long chain alcohols, such as policosanol, derived from natural waxes. Policosanol derived from sugarcane wax was found to effectively hydrate the skin and beneficially modulate sebum levels as well, suggesting its potential utility as a natural non-animal derived alternative to lanolin (4).

HONING IN ON MOLECULAR TARGETS

Recent research findings lend credence to the fact that metabolism, gene expression, and ageing intersect at the molecular level. The indices of ageing have been linked to the morphology of cellular DNA. A telomere is a region of highly repetitive DNA at the end of a linear chromosome that functions as a disposable buffer which is gradually depleted during the continued cell replication. The deterioration of tissues with age has been linked to shortened telomeres.

Molecular biology plays a pivotal role in innovating cosmeceuticals. Ingredient development now begins with the identification of molecular targets. For example, aquaporins (AQPs) are proteins that facilitate the transport of water across cell membranes. AQP3 expression is related to the expressions of other epidermal proteins involved in water maintenance. The expressions of AQP3 water channels are strongly affected by age and chronic sun exposure, and a defective osmotic equilibrium could occur in the epidermis, which would account for the skin dryness observed in older people and skin areas most exposed to sunlight (5). Natural actives that can modulate AQP3 expression would therefore be effective hydrating agents and emollients.

A major breakthrough in the anti-ageing research commenced with the identification of a few genetic pathways that are regulatory master keys in the ageing process, Sir2 family of proteins (sirtuins or silent information regulators) are that have been shown to regulate ageing and longevity in a number of model organisms including yeast and round worms, in response to nutritional and hormonal cues. An analogous gene, SIRT1 was located in humans. Sirtuins play in the modification of nuclear receptors and the corresponding age-associated metabolic diseases. Nuclear receptors sense a variety of environmental triggers, including dietary components and steroid hormones, and influence metabolic and the ageing process. Sirtuins are associated with genes that coordinate and optimize the functions of cells as cells struggle to survive in a stressful environment, as it is the case for skin cells. Therefore, cutting edge anti-ageing strategies utilize cosmeceuticals with the potential to modulate sirtuin (6). Resveratrol is one such natural compound, shown to modulate sirtuin expression.

An increasing amount of scientific evidence supports the beneficial "anti-ageing" effects of several phytonutrients at the molecular level. For example, plant flavonoids inhibit the age-related atherosclerotic deposits in animals by influencing vascular cell adhesion molecule-1 (VCAM-1) and monocyte chemoattractant protein-1 (MCP-1) gene expression (7). The micronutrient mineral selenium, long known to offer protection against several forms of cancer, was shown to exert its anti-senescence influence in animal models, at the genetic level. *In vitro* experiments revealed that selenium supplementation significantly increased cellular telomerase activity and hTERT (human telomerase reverse transcriptase) gene expression and augmented telomere length (8).

At the fundamental level, phytonutrients such as curcumin (derived from turmeric roots) have been shown to up regulate antioxidant gene expression in animal models. The multifunctional health benefits of the curcuminoids are well researched and these antioxidant compounds are potentially useful in preventing inflammation and several types of cancer, including melanomas. A common spice used in South Asian cooking, turmeric and more appropriately the curcumin-oids have been preclinically and/or clinically validated for beneficial effects in a number of disease conditions ranging from Alzheimer's disease to cystic fibrosis (9). The antioxidant effects of curcuminoids combined with their known inhibitory effects on cyclooxygenase 2 (COX-2) render them useful as ingredients in anti-ageing formulations, and in topical formulations designed to maintain general skin health and integrity. Oxidative stress and inflammation are major players in the ageing process. The anti-inflammatory role of curcuminoids is well established. Curcuminoids have been shown to inhibit nuclear factor kappaB (NFkB) a transcription factor that triggers inflammatory mediators. NFkB has been implicated in a variety of chronic disease conditions ranging from cardiovascular diseases to cancer (10). Curcuminoids offer antioxidant support, anti-inflammatory support, support a healthy immune system, prevent connective tissue break down through inhibiting destructive enzymes (such as collagenase, elastase, hyaluronidase) (11). Tetrahydrocurcuminoids is a colourless composition derived from the yellow curcuminoids, useful in brightening and lightening skin tone, and in offering protection against the development of melanoma (12-14). In summary, scientific validation for the use of natural actives in cosmetic and nutricosmetic compositions continues to expand. It is therefore no coincidence that phytonutrients and other molecular entities from natural sources enjoy a special status in the repository of cosmetic ingredients, that nurture skin health and wellbeing.

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