

Chronic inflammation and its effect on skin ageing

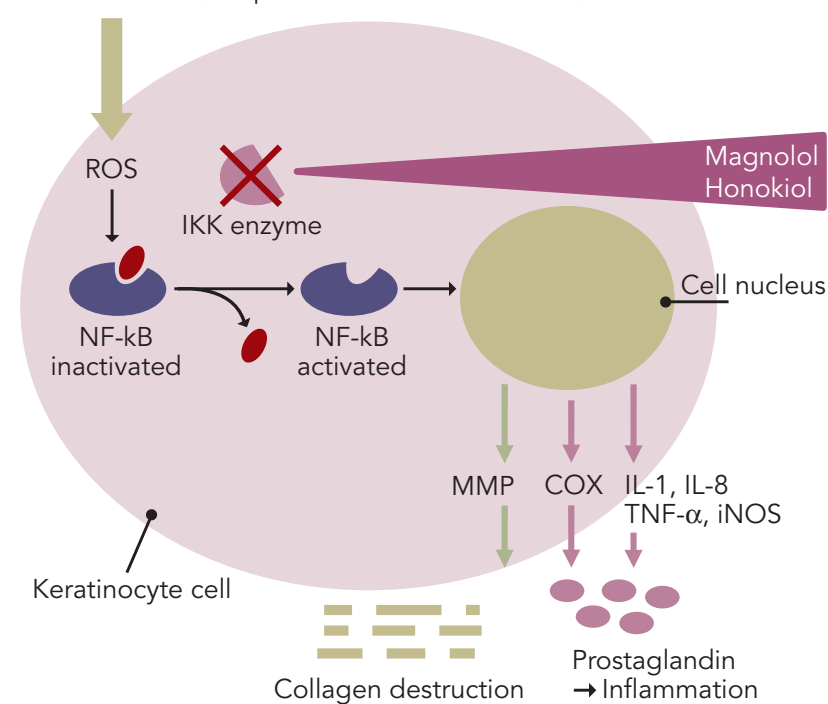
In the process of ageing, the immune system becomes less effective and its capacity to manage the inflammatory response is reduced

This can lead to chronic inflammation characterised by a slow but continuous production of free radicals causing wrinkles and sagging skin. The term “inflamm-aging” describes this close relationship between inflammation and ageing.

Inflammation

Inflammation is our basic defence. In response to cell injury elicited by trauma or infection the inflammatory response sets in, constituting a complex network of molecular and cellular interactions directed to facilitate a return to physiological homeostasis and tissue repair. The response is composed of

Aging
Internal stress (lifestyle, diet, sleep)
External stress (UV, pollution, chemical irritants)



both local events and a systemic activation mediated by cytokines.

Inflammation evokes inflammatory cells like macrophages, neutrophils, monocytes, to invade the site of infection. This leads to the release of large amounts of free radicals and the death and degradation of the organism, agent or affected cells. After that, inflammation resolves, the healing step initiates and tissue homeostasis is restored.

If tissue health is not re-established or in response to stable low-grade irritation, inflammation becomes a chronic condition. During chronic inflammation, the immune system persists to produce low levels of the key molecular players such as prostaglandins, cytokines and nuclear factor-kappa B (NF-κB), thus generating a constant supply of free radicals that overwhelm our antioxidant defences and damage DNA, and therefore ages us. In skin, chronic inflammation causes the known phenomena of skin ageing such as wrinkles and loss of elasticity, the ultimate cause being the breakdown of collagen and elastin fibres.

Ageing of the skin is a process with very direct effects on the daily life and psychological and social well-being of an individual. The skin is a major sensory organ, it is the body's first line of defence against infectious organisms and physical harm, and it plays a very important role in controlling body temperature. Slowing down the ageing processes of the skin will therefore not only help us to keep a more youthful appearance but will most likely have beneficial effects for the whole organism.

Inhibition of Inflammaging

The Nuclear Factor-kappa B (NF-κB) is an important transcription factor in the regulation of inflammation; many pro-inflammatory stimuli can activate it. NF-κB exists in a latent state in the cytoplasm bound to specific inhibitory proteins, IκBs (Inhibitor of κB). Activation of NF-κB is initiated by the signal-induced degradation of IκB proteins. This occurs via activation of a kinase called the IκB kinase (IKK). When activated, usually by signals coming from the outside of the cell, IKK phosphorylates two serine residues in IκB that will lead to its degradation by the proteasome. NF-κB is now free to enter into the nucleus to regulate the transcription of multiple pro-inflammatory mediators genes and Matrix-Metalloproteinases (MMP). Finally, NF-κB is turned off by itself.

In the skin, an excess of reactive oxygen species (ROS) can make NF-κB chronically active, leading to a continued release of inflammatory mediators

and thus to chronic inflammation. These ROS can be over-generated by ageing, external stresses (such as UV, pollution, toxins, chemical irritants) and internal ones (lifestyle, diet, lack of sleep).

Magnolia officinalis is a medicinal plant belonging to the China pharmacopoeia and is a natural inhibitor of NF-κB. Its bark has been used for thousands of years in Asia to treat the stagnation of qi (lack of energy) and more precisely digestive disorders, anxiety and allergic diseases. In Japan, two of the most popular herbal medicines used, one called saiboku-to and another called hange-koboku-to, contain magnolia bark and have been used for treating ailments from bronchial asthma to depression and anxiety.

The two pharmacologically active substances present in the Magnolia bark are called magnolol and honokiol. These two low molecular weight lignans synergistically reduce inflammation by inhibiting NF-κB activation and activity through IKK (IκB kinase) enzyme inactivation. They also inhibit the production of inducible-nitric oxide synthase (iNOS), interleukine 8 (IL-8), tumor necrosis factor κ (TNF-κ) and COX-2. As well as this, they have antioxidant, anti-bacterial and anti-angiogenic effects and can relieve spasms. Magnolol has also anti-depressive, anti-allergic and anti-asthma effects whereas honokiol is anxiolytic. Japanese researchers have determined that the magnolol and honokiol components of Magnolia officinalis are one thousand times more potent than alpha-tocopherol (vitamin E) in their antioxidant activity.

Preparation of a cosmetic ingredient based on Magnolia bark

Magnolol and honokiol have low solubility in water and it has been necessary to develop a proprietary technique to extract the active substances for use in a water soluble ingredient.

Ethanol and water are used to obtain an extract of the Magnolia bark which is then sprayed onto a carrier of maltodextrin and liposomes. The powder that results is free of alcohol and contains pre-liposomes. These pre-liposomes turn into liposomes immediately when in contact with water and then the active ingredients are incorporated into their bi-layer membranes.

The process has a number of advantages including the fact that the resulting ingredient is preservative free and alcohol free, with good skin delivery due to the liposomes.

Study Results

A clinical study was performed with women experiencing visible facial skin redness. A cream containing 0.5 percent Magnolia based ingredient was tested in a controlled half side comparison. Skin redness was determined by measuring the parameter a* in the L*a*b* colour system using a chromameter. Results showed that the Magnolia based ingredient significantly reduced half-side facial skin redness compared to the placebo.

A cream containing 0.5 percent of the active was applied on the eye contour area to evaluate its anti-ageing effect. Two parameters were assessed using a cutometer: the skin elasticity and the skin fatigue which indicates the loss of elasticity due to repetitive mechanical stresses (skin elasticity tends to decrease with age whereas skin fatigue increases). Results showed that Magnolia extract based cream increased the skin elasticity of the crow's feet and decreased the skin fatigue compared to the placebo.

To determine the improvement of the skin quality (in vivo), a cream containing 0.5 percent the ingredient was applied to both the face and the inner side of the forearms of volunteers aged from 54 to 78. Skin hydration and firmness were determined using a corneometer and a cutometer respectively on the inner side of forearms. TransEpidermal Water Loss (TEWL) was determined using AquaFlux on the face. Results showed that the cream containing Magnolia significantly increased skin hydration and firmness and decreased TEWL compared to the placebo. An overall improvement was achieved in the skin quality where the anti-inflammaging ingredient was applied.

The Magnolia based ingredient was shown to prevent loss of skin elasticity, to restore moisture and to reduce redness in facial skin. This is an effective ingredient to fight against the consequences of chronic inflammation in the skin.

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