Summary Of Key Scientific Studies: Rebuilding & Strengthening of Skin Collagen & Elastin

A well-balanced diet rich in nutrients is essential not only for the health of internal tissues and organs of the human body, but is equally important for maintaining healthy skin. As a person ages, the total quantities of collagen and elastin decrease, and consequently, the number of blood vessels that supply nutrients to the skin begin to decline. With the decrease in the levels of collagen, elastin and hyaluronic acid, the hydration, strength and elasticity in the skin's layers decline. The result is that the skin becomes thinner and dehydrated, starts to sag and develops wrinkles. Another major factor contributing to skin aging and skin disorders is oxidative stress, particularly from ultraviolet (UV) radiation. Free radicals mediate damage to proteins, lipids, and saccharides in skin cells, and in the endothelial cells lining blood vessels that supply the dermis layer of the skin. Free radicals also cause damage to collagen, elastin and other structural proteins in skin by inhibiting their synthesis and activating enzymes and inflammatory molecules that damage them. All these free radical-mediated processes contribute to accelerated aging of the skin (Reviewed in Emerit, 1992; Kagan et al, 2002; Svobodova et al, 2006). Dietary intake, in combination with topical application of nutrients that protect and support the skin are therefore crucial to maintaining skin health (Afaq and Mukthar, 2006; Jackson et al, 2002; Sies and Stahl, 2004).

MASQUELIER's OPCs has been shown in scientific studies to exhibit strong antioxidant activity as well as enhance synthesis of collagen and elastin and protect them, indicating a capacity to significantly promote skin health.

An independent single-blinded, controlled, human intervention study conducted by Hughes-Formella, et. al. demonstrated that MASQUELIER's OPCs dietary supplement in combination with a topical application containing ester-OPCs (cream or lotion) significantly reduced UV-induced skin erythema. UV-induced skin erythema has been indicated to be caused by an inflammatory process mediated by free radicals, and has been suggested to contribute to photo-aging and photo-carcinogenesis of skin (Trautinger, 2001). The study investigators proposed that MASQUELIER's OPCs (in the form of dietary supplement + topical application) can significantly reduce UV-induced skin erythema, likely through scavenging of free radicals (Hughes-Formella et al, 2007), and thereby have possible benefit in maintaining healthy skin and reducing risk of damaging effects of UV exposure. The study also demonstrated that in dietary supplement form in combination with the topical application also significantly improved skin hydration, another factor that plays an important role in keeping skin healthy and preventing accelerated skin aging.

Evidence for the skin health-promoting effects of MASQUELIER's OPCs was also provided by studies performed in animals. Using radio-labelled MASQUELIER's OPCs, it was shown that this compound predominantly localized to tissues rich in collagen and glycosaminoglycans, including skin connective tissue layers and blood vessels. This indicated that this phytonutrient is bioactive in these tissues (LaParra et al, 1978). Investigations in animals also demonstrated that MASQUELIER's OPCs inhibited degradation of elastin and collagen to strengthen dermal connective tissue in rabbits (Tixier et al, 1984) and decrease capillary hyperpermeability in rats (Gavignet-Jenin et al, 1981), as well as to promote collagen synthesis in guinea pigs (Pfister, 1982), indicating that this specific OPCs compound can strengthen the structure and function of skin layers. Additionally, MASQUELIER's OPCs was found to reduce inflammation caused by the chemical carrageenin, which induces oxidative stress in the area of exposure (Barbier et al, 1988; Blazso and Gabor, 1980), and partially rescue animals from disorders induced by deficiency of vitamin C, which exerts a well-established antioxidant activity and plays a key role in synthesis of collagen that is present in skin and blood vessels that supply the skin (LaParra et al, 1979).

MASQUELIER's OPCs bind to collagen fibres and significantly increase their stability and protect them from denaturation by collagenase, whereas bioflavonoids and tannins were found to offer little or no protection (Masquelier et al., 1981) as demonstrated through *In vitro* studies. MASQUELIER's OPCs was also found to bind elastin and induce a marked inhibition of its degradation by elastase (Tixier et al, 1984). Further, studies showed that MASQUELIER's OPCs is an effective scavenger of

superoxide radicals generated *in vitro* (Masquelier, 1988; Meunier, 1989) or by activated leucocytes in inflammatory reactions (Barbier et al, 1988), inhibits lipid peroxidation in cells induced by various pro-oxidants (Bos et al, 1996; Meunier et al, 1989, de Haan et al, 2006b) and protects vascular endothelial cells from oxidative stress-induced cell death (de Haan et al, 2006a). The *in vitro* and cell studies therefore suggested that the positive effects on skin health exerted by MASQUELIER's OPCs *in vivo* were likely mediated by its ability to bind collagen and elastin, and increase their stability as well as its strong free-radical scavenging activity.

In summary, evidence from human, animal and *in vitro* studies strongly supports that MASQUELIER's OPCs can help maintain healthy skin structure and function, promote skin hydration and reduce risk of UV-induced skin damage, likely through its significant antioxidant activity and its ability to bind the essential proteins collagen and elastin, promote the synthesis and inhibit their degradation.

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