

Editorial

## Oral collagen in reversing aging

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Skin aging has become a significant concern even for younger people, mainly owing to increased life expectancy. In this context, the use of nutricosmetics as supplements has increased in recent years. Moreover, numerous scientific studies have shown the benefits of hydrolyzed collagen (HC) supplementation in improving the signs of skin aging.

Human skin aging is a complex and multifactorial process that leads to many functional and esthetic changes. Internal factors such as planned cell destruction, hormonal changes, and chronic inflammations affect all organs including the skin. External factors such as exposure to ultraviolet rays or cigarette smoke are other factors that affect skin aging. These factors cause thinning of the epidermis, a decrease in elasticity, and an increase in skin lines.

Collagen is the main structural protein in connective tissues such as the skin, tendons, cartilage, and bones constituting 25–30% of all proteins in the body. Collagen is synthesized in the body by combining several different amino acids and vitamin C as a cofactor. Glycine, proline, and hydroxyproline make up 57% of the total amino acids of collagen. Collagen is a component of the extracellular matrix of cutaneous tissue representing up to 75% of its total weight, and its primary function is related to providing mechanical support. In association with hyaluronic acid, reticulin, elastin, and other fibers found in the extracellular matrix, collagen forms a support network for fibroblasts, keratinocytes, melanocytes, and specialized cells of the skin immune system.

The dermal collagen fiber network becomes increasingly fragmented with age. In addition, aging also increases the generation of metalloproteinases, which are enzymes that degrade collagen fibers, thus decreasing the synthesis of new extracellular matrix components including the type of collagen produced by dermal fibroblasts. The overlap of intrinsic and extrinsic aging leads to structural and functional changes in the dermis including volume reduction, elasticity loss, decreased epidermal thickness, increased wrinkles, and decreased capacity to retain moisture through the skin owing to decreased hyaluronic acid in the extracellular matrix.

Aside from the traditional systemic antioxidants, a wide range of dietary supplements have been used to improve skin health and achieve a younger appearance such as some marine protein-based macromolecules. However, HC which has been used as one of the most recent and promising anti-aging systemic supplementations has demonstrated functional and beneficial effects on the skin in several scientific studies, mainly by improving the clinical signs of skin aging. Some studies have shown that the oral administration of bioactive collagen peptides can reverse the age-dependent reduction in collagen synthesis. These peptides are obtained from the enzymatic hydrolysis of natural collagen. Studies have shown that the bioactive peptides of oral collagens have relatively fast absorption due to their low molecular weight. Once digested,

they are metabolized to dipeptides and tripeptides in the gastrointestinal tract, transported through the bloodstream, and accumulate in the skin to form new collagen fibers.

Evidence from animal models shows that oral administration of collagen reduces epidermal hyperplasia caused by the Sun's ultraviolet rays and increases fibroblasts and extracellular matrix proteins such as hyaluronic acid and hydroxyproline. Fibroblasts are the primary cells of the dermis that produce collagen and extracellular matrix and play an essential role in maintaining and improving the skin's elastic properties. Moreover, oral collagen peptides can reduce the production of metalloproteinase 3 and interleukin-1 alpha and slow down the process of collagen destruction in the dermis. Clinical trials that administered 2.5 and 5 g collagen peptides demonstrated that supplementing 2.5 g for 90 days would be sufficient to obtain beneficial effects.

The HC supplements are rich in hydroxyproline, proline, and glycine amino acids. Among these proteins, only hydroxyproline is a component of collagen. Several studies have shown that prolylhydroxyproline and hydroxyprolylglycine are absorbed after ingestion as dipeptides, not as amino acids and become deposited on the skin. These dipeptides increase the bioactivity of dermal fibroblasts by increasing collagen synthesis, thus improving hydration and elasticity and reducing wrinkles.

In many studies, liquid and solid oral collagen supplements (capsules, sachets, and syrups) showed good patient

acceptability and no adverse effects. It may be avoided in individuals with a history of gastrointestinal problems. As per a systematic review and meta-analysis, ingesting HC for 90 days effectively reduces skin aging, as it reduces wrinkles and improves skin elasticity and hydration. Despite the heterogeneity among studies, which used different collagen peptide concentrations, formulations, origins (pigs, fish, chicken, etc.), and forms of administration (liquid and solid) of the oral supplement, most of the studies reported improved skin hydration and elasticity, increased dermal density, and reduced facial wrinkles. The beneficial effects were evident at 60 and 90 days after the start of supplementation and were maintained for 30 days after the end of the intervention. Thus, the benefits of this supplementation on the skin are related to its maintenance period.

Topical skin care products such as creams, lotions, and serums often do not reach the deeper layers of the skin. However, injectable collagen can affect skin elasticity on healthy skin and disorders such as lichen sclerosis. Different dietary supplements and systemic antioxidants such as some marine protein-based macromolecules have been used for skin rejuvenation. However, HC is one of the newest and most popular systemic supplements.

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