GLIWA, Anna, KUROWSKI, Marek, KUCZAPSKA, Karolina, RYGLEWICZ, Monika, FABIAN, Dariusz, LESZCZYNSKA - KNAGA, Elbieta, JAKUBCZYK, Natalia, RUTKOWSKA-KAWALEC, Weronika, MOCZYDŁOWSKI, Pawel and MICHHALCZUK, Karolina. Effects of hydrolyzed collagen supplementation for Skin Anti-Aging. Quality in Sport. 2025;37:57098. eISSN 2450-3118.
https://doi.org/10.12775/QS.2025.37.57098
https://apcz.umk.pl/QS/article/view/57098

The journal has been 20 points in the Ministry of Higher Education and Science of Poland parametric evaluation. Annex to the announcement of the Minister of Higher Education and Science of 05.01.2024. No. 32553.
Has a Journal's Unique Identifier: 201398. Scientific disciplines assigned: Economics and finance (Field of social sciences); Management and Quality Sciences (Field of social sciences).
Punkty Ministerialne z 2019 - aktualny rok 20 punktów. Załącznik do komunikatu Ministra Szkolnictwa Wyższego i Nauki z dnia 05.01.2024 r. Lp. 32553. Posiada Unikatowy Identyfikator Czasopisma: 201398.
Przypisane dyscypliny naukowe: Ekonomia i finanse (Dziedzina nauk społecznych); Nauki o zarządzaniu i jakości (Dziedzina nauk społecznych).

The authors declare that there is no conflict of interests regarding the publication of this paper.
Received: 17.12.2024. Revised: 14.01.2025. Accepted: 14.01.2025 Published: 16.01.2025.

Effects of hydrolyzed collagen supplementation for Skin Anti-Aging

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Abstract
In an era of an aging population with the rise of social media, both men and women are paying more and more attention to the healthy appearance of their skin and overall health.
Collagen is an essential component of the structure of the skin. With age, the amount of collagen in the skin decreases, there is a loss of elasticity as a result, wrinkles form and the appearance of the skin deteriorates. On the market there are more and more preparations both in the form of creams and means for oral application. One of the most popular dietary supplements that affect the quality of the skin and with tested bioavailability is hydrolyzed collagen.
One can find many studies showing the positive effects of collagen supplementation on improving the quality and alleviating the visible signs of skin aging. In this review paper, we aim to evaluate the current state of knowledge of the effectiveness of hydrolyzed collagen supplementation on skin quality status. In order to investigate the efficacy and effects of hydrolyzed collagen for the skin, we need both preclinical studies, availability assessments and controlled clinical trials on a wide range of patients.
Overall, it can be concluded that as little as 12 weeks of hydrolyzed fish collagen supplementation improves the quality and appearance of skin in the aging population. Importantly, HC-containing formulations were found to be safe and well-tolerated. However, further large-scale randomized controlled studies taking into account factors such as excipients in the supplements, age range and general lifestyle of the subjects are needed to confirm these results.
Materials and Methods:
A comprehensive literature view was conducted using the PubMed, GoogleScholar and Medline databases. Keywords included: hydration, hydrolyzed collagen, skin elasticity, wrinkles, skin moisture, skin aging, skin rejuvenation

Keywords: hydration, hydrolyzed collagen, skin elasticity, wrinkles reduction, skin moisture, skin aging, skin rejuvenation, skin aging, anti-aging ,supplements, skin health, anti-aging

Introduction

Skin aging is a natural progression influenced by a blend of internal alterations and external elements that lead to damage, with most of these modifications occurring in the dermis.
Skin appearance is influenced by nutrition as well as endogenous and environmental factors, including the exposure to chemicals, smoking, or ultraviolet radiation. Skin aging is due to changes in the deeper layer of the skin. Supplements taken orally, in contrast to topical applications, represent a practical approach to the prevention of skin aging because they can be delivered to the dermis through the circulation.
Collagen is essential structural protein found in diverse connective tissues like skin, tendons, cartilage, and bone, making up a substantial fraction, approximately 25-30%, of the total proteins in the human body.[1] Hydrolyzed collagen is usually obtained from cow, pig, and chicken sources. In recent years, collagen derived from fish has emerged as an alternative source due to lower environmental impact and risk of disease transmission. Further, marine fish collagen and collagen peptides have a high degree of homology to human structure and bioavailability through the gastrointestinal barrier. [2,3]

Mechanism

Peptides derived from the breakdown of collagen are transported to various tissues, including the skin. Peptides absorbed by the skin (especially dipeptides containing Hyp, like Pro-Hyp) play a key role. These substances become accumulated in the form of peptides or amino acids. Protein hydrolysates are easier to digest and absorb than intact proteins, which increase the production of amino acids after meals. [5] When HC is ingested, it travels through the bloodstream in the form of dipeptides (e.g., Gly-Pro and Pro-Hyp) and tripeptides (e.g., Gly-Pro-Hyp) [6]. An in vivo mouse model study found transient increases in the Gly-Pro-Hyp levels in the blood of both humans and mice and that other collagen peptides were also transported to the skin after the ingestion of HC. At 14 days after the administration of [7] Gly-Pro-Hyp, almost all radioactivity disappeared from the organs, except for the skin, with a radioactivity of 70% observed after 6 h. [8]

This accumulation is responsible for the chemotaxis of fibroblasts located in the skin, increasing their activity. [6,12] In the dermal part there is an increase in fibroblasts and HA production the result of this process is an increase in skin hydration levels in the outermost skin layer. [9] Collagen peptides support collagen synthesis at both the mRNA and protein levels, forming robust collagen fibrils that strengthen the skin's natural barrier, ultimately enhancing skin elasticity. [10] Another benefit of collagen supplementation is the stimulation of filaggrin production. Filaggrin is one of the key proteins that determine the normal barrier function of the epidermis. Filaggrin increases the levels of aa and amino acid derivatives, which are important components of the skin's NFM (Natural Moisturizing Factors) found in the SC.

Studies have shown that the consumption of collagen peptides (APCP) improves skin barrier function and skin hydration, as evidenced by a significant increase in total AA and AAD content in SC in the supplement group compared to the placebo group. [11]

What also speaks positively for collagen supplementation is the lack of side effects caused by collagen supplementation. So far, only an anaphylactic reaction has been observed in a patient with atopic dermatitis who is allergic to the ingredient. One study reported a patient with atopic dermatitis who experienced episodes of anaphylaxis after ingestion of a dietary supplement that contained hydrolyzed fish collagen. [4]

Discussion

To confirm considerations, we will cite one of the most recent studies conducted in 2020 in which 10g of Vinh Wellness Collagen (VWC) was used. Participants were instructed to consume 10g of hydrolyzed collagen or placebo powder daily, in the morning, on an empty stomach for 12 weeks. The study used analysis of both the size of skin wrinkles and skin elasticity (Cutometer® device was used). After 12 weeks, there was a 24% reduction in wrinkle score on the right side of the face for participants supplemented with VWC compared to placebo.[9]This randomized, triple-blind, placebo-controlled study evaluated the efficacy and safety of VWC on face wrinkles, elasticity, and self-reported improvements in skin health. After 12 weeks, participants supplemented with VWC showed a significant 24% improvement in the absolute wrinkle score on the right side of the face compared to placebo. On both sides of the face, there was a significant decrease in the wrinkle score from baseline to week 12 for participants supplemented with VWC.

Korean females and males experienced a significant improvement in elasticity following 12-week supplementation with 3 g of collagen peptide and vitamin C [13] or 3 g hydrolyzed fish collagen combined with astaxanthin. [14] Supplementation with 10 g of collagen peptides combined with vitamins A, C, and E and zinc significantly improved gross cheek elasticity in females aged 40-60 years after 90 days. [15] This indicates that collagen peptides may act in sync with other nutrients to improve skin elasticity. Future studies should consider investigating the potential synergistic effects of VWC with other skin enhancing nutrients.

Confirming the above observations, one can cite a study where a reduction in facial wrinkles was observed after 30 days of HC supplementation. [16] Furthermore, as much as a 10% reduction in wrinkles around the eyes was observed in a study where the dose of supplemented collagen was 10g for a period lasting 12 weeks. [17]

It could also be seen in the study that the response to collagen supplementation between the right and left sides of the face was different. You can find a study in which it was shown that the left side of the face is more susceptible to photoaging and the risk of developing melanoma. The reason for this is believed to be exposure to sunlight while driving as a driver. [20]

Another factor contributing to faster aging of the left side of the face may be related to sleeping on the left side. The face then is subjected to micro-pressure and facial wrinkles form faster. For this reason, patients are advised to sleep on their backs. [21]

Limitations

When analyzing the studies, one can see significant differences in the composition of the preparations and sources of collagen. The source of hydrolyzed fish collagen can be different species of fish or different parts of fish. Importantly, the dosage (from 300mg to 10 grams) and forms of administration of collagen (powder, liquid) and additional active ingredients (vitamin A,E,C coenzyme Q10,hyaluronic acid, etc) also vary. [18] The effect of supplementation will also be variable due to diversity in the population: women, men, teenagers, adults, and post-menopausal women.

In the studies reviewed, a limitation can be seen in the form of patient's lifestyles. Supplementation in people with a healthy lifestyle, eating a well-balanced diet, taking care of their hydration and playing sports can have a more pronounced and faster effect on skin appearance than in less health-conscious individuals.

However, it is essential to note that in all the studies reviewed, oral consumption of collagen hydrolyzate and HC peptides has shown effectiveness in reducing signs of skin aging and is safe to consume, with potential long-term benefits.

Conclusions

Hydrolyzed collagen is a protein whose long-term use is more beneficial on skin hydration and elasticity than short-term use of collagen. It is safe and highly demanded in the supplement industry due to its benefits on the skin and biocompatibility. There were many of reports providing evidence that oral ingestion of collagen hydrolysates promotes the growth of fibroblasts and stimulates the production of new collagen type I in the dermis.

However large-scale randomized control trials are required to examine the clinical benefits of oral collagen supplements.

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Methodology: [MK], [KK],[AG], [MR], [DF],[ELK], [NJ], [WRK] ,[PM], [KM]
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The authors have read and agreed with the published version of the manuscript.

Funding Statement
This research received no external funding.

Institutional Review Board Statement
Not applicable.

Data Availability Statement
Not applicable.

Acknowledgments
Not applicable.

Conflict of Interest Statement
The authors declare no conflict of interest.

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