REVIEW ARTICLE

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Effects of oral collagen peptides supplementation on improving skin elasticity, hydration, and overall skin condition

Wpływ doustnej suplementacji peptydami kolagenu na poprawę elastyczności, nawilżenia i ogólnego stanu skóry

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A – Koncepcja i projekt badania, B – Gromadzenie i/lub zestawianie danych, C – Analiza i interpretacja danych, D – Napisanie artykułu, E – Krytyczne zrecenzowanie artykułu, F – Zatwierdzenie ostatecznej wersji artykułu

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Abstract

Introduction and Ojective. The review analyzes evidence on oral hydrolyzed collagen peptide supplementation for improving skin hydration, elasticity, and condition, while exploring collagen's biological role and skin aging mechanisms. Aging alters skin structure and function, especially in the dermal extracellular matrix, where collagen loss, reduced fibroblast activity, and oxidative stress lower elasticity and cause visible aging. Intrinsic aging and UV-induced photoaging accelerate these effects. Given collagen's role in dermal integrity, interest has grown in hydrolyzed collagen due to its higher bioavailability.

Review Method. An analysis was conducted of studies published between 2018 – 2024.

Brief description of the state of knowledge. The review shows that the oral intake of low molecular weight collagen peptides significantly improves skin hydration, elasticity, and reduces wrinkle depth. These effects are linked to enhanced fibroblast activity and increased synthesis of collagen, elastin, and hyaluronic acid. Anti-oxidant and anti-inflammatory actions may also contribute to the benefits. Collagen supplementation appears to be safe and well-tolerated. Current data support its use as a promising dermonutritional strategy to improve skin health and counteract visible aging.

Summary. Clinical trials support the use of oral hydrolyzed collagen as an effective intervention for age-related skin decline. Supplementation improves hydration, elasticity, density, and wrinkle depth by enhancing peptide absorption and dermal accumulation. The peptides stimulate fibroblasts, boosting collagen, elastin, and glycosaminoglycan synthesis, and provide anti-oxidative and anti-inflammatory effects. Studies report good safety, although more diverse, long-term research is needed to confirm the benefits and optimize use.

Keywords

collagen, skin hydration, skin elasticity, photoaging, hydrolyzed collagen, collagen peptides

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Streszczenie

Wprowadzenie i cel pracy. W niniejszym artykule przeanalizowaliśmy dane dotyczące skuteczności doustnej suplementacji hydrolizowanymi peptydami kolagenu w kontekście poprawy nawilżenia, elastyczności i kondycji skóry. Starzenie wpływa na strukturę i funkcję skóry, szczególnie w macierzy zewnątrzkomórkowej skóry właściwej, gdzie utrata kolagenu, spadek aktywności fibroblastów i stres oksydacyjny obniżają elastyczność i przyspieszają widoczne oznaki starzenia. Starzenie wewnątrzpochodne oraz fotostarzenie wywołane promieniowaniem UV przyspieszają te procesy. Z uwagi na kluczową rolę kolagenu w zwiększaniu nawilżenia i elastyczności oraz poprawie kondycji skóry rośnie zainteresowanie jego hydrolizowaną formą o wyższej biodostępności.

Metody przeglądu. Szczegółowa analiza badań opublikowanych między 2018 a 2024 rokiem.

Opis stanu wiedzy. Wykazano, że doustne przyjmowanie peptydów kolagenowych o niskiej masie cząsteczkowej poprawia nawilżenie i elastyczność skóry oraz zmniejsza głębokość zmarszczek. Efekty te wiążą się ze zwiększoną aktywnością fibroblastów i syntezą kolagenu, elastyny oraz kwasu hialuronowego. Właściwości przeciwutleniające i przeciwzapalne peptydów kolagenowych mogą dodatkowo wspierać te korzyści. Suplementacja kolagenem jest bezpieczna i dobrze tolerowana przez organizm. Mimo pewnych jej ograniczeń, dane potwierdzają zasadność zastosowania suplementacji kolagenem jako strategii dermożywieniowej przyczyniającej się do poprawy kondycji skóry i spowalnianiu procesu starzenia.

Podsumowanie. Badania kliniczne potwierdzają skuteczność doustnej suplementacji hydrolizowanym kolagenem w spowalnianiu starzenia się skóry. Poprawia ona nawilżenie, elastyczność, gęstość skóry i zmniejsza głębokość zmarszczek dzięki dobremu wchłanianiu peptydów i ich akumulacji w skórze właściwej. Peptydy stymulują fibroblasty, zwiększając syntezę kolagenu, elastyny i glikozaminoglikanów, oraz wykazują działanie przeciwutleniające i przeciwzapalne. Suplementacja jest dobrze tolerowana, choć potrzebne są dalsze długoterminowe badania w tym zakresie.

Słowa kluczowe

kolagen, fotostarzenie, nawilżenie skóry, hydrolizowany kolagen, peptydy kolagenu, elastyczność skóry

INTRODUCTION

With age, human skin undergoes structural and functional alterations, especially within the dermal extracellular matrix, where collagen degradation, reduced fibroblast activity, and oxidative stress contribute to decreased elasticity and visible signs of aging. Both intrinsic aging and photoaging caused by UV radiation accelerate these changes. Given the fundamental role of collagen in maintaining dermal integrity, interest has increased in collagen supplementation, particularly in hydrolyzed forms with greater bioavailability. A review of clinical studies published from 2018–2024 shows that the oral intake of low molecular weight collagen peptides, especially marine-derived, significantly improves skin hydration, elasticity, and reduces wrinkle depth within 8–12 weeks. These effects are associated with enhanced fibroblast activity and increased synthesis of collagen, elastin, and hyaluronic acid. Anti-oxidant and anti-inflammatory actions may also contribute to the benefits. Collagen supplementation appears safe to be and well-tolerated, and despite some limitations, current data support its use as a promising dermonutritional strategy for improving skin health and counteracting visible aging.

The multilayered architecture of human skin. The skin, recognized as the body's largest organ, forms a critical barrier and has absorptive functions essential for maintaining homeostasis. It is structurally organized into three primary layers: the epidermis, dermis, and subcutaneous tissue. The micro-anatomy of the skin exhibits significant regional heterogeneity in terms of epidermal and dermal thickness, the spatial distribution of epidermal appendages, and the density of melanocytes [1].

The epidermis, forming the superficial barrier of the skin, is stratified into four histological layers: stratum basale, stratum spinosum, stratum granulosum, and stratum corneum. It comprises several specialized cell populations, including keratinocytes, melanocytes, Langerhans cells, and Merkel cells, each contributing to pigmentation, immune surveillance, and mechano-sensation, respectively. The transition between the epidermis and dermis is defined by the epidermal-dermal junction, which includes the basement membrane – a complex extracellular matrix that mediates cellular adhesion and signalling. Situated beneath this interface, the dermis confers structural integrity and facilitates metabolic support through its vascular and connective tissue networks [2].

Skin aging as a process. Cutaneous aging is a complex, multifactorial physiological process that progresses gradually over time, and is influenced by both intrinsic and extrinsic factors [3, 4]. Aging is characterized as a progressive, time-dependent decline in physiological function and regenerative capacity in higher organisms, associated with an elevated risk of morbidity and mortality [5].

The onset of the aging processes can be detected as early as the second decade of life, encompassing multiple significant structural and functional alterations. While these changes are initially subtle and clinically inconspicuous, more pronounced and measurable modifications typically manifest by the third decade [6].

All three layers of the skin undergo degenerative alterations with advancing age, with the dermis exhibiting the most pronounced structural and functional changes, such as collagen degradation and reduced fibroblast activity. Skin aging is influenced by a combination of intrinsic factors, including genetic predisposition, hormonal changes, and cellular senescence, as well as such extrinsic factors as ultraviolet (UV) radiation, pollution, smoking, and poor nutrition [3, 7, 8].

Intrinsic or chronological aging is a genetically-programmed process that naturally occurs within the skin over time, and is unavoidable [1]. Intrinsic aging is clinically characterized by the appearance of fine lines, increased skin translucency and thinning, reduction in subcutaneous adipose tissue, diminished skin elasticity, and decreased hydration levels [9]. Extrinsic aging involves similar alterations seen in intrinsic aging, but is additionally marked by pronounced coarse wrinkling, irregular and increased pigmentation (mottled hyperpigmentation), and the accumulation of aberrant elastin fibres in the dermis, a condition known as solar elastosis [10, 11].

Photoaging refers to the premature aging of the skin induced by chronic exposure to ultraviolet A (UVA) and ultraviolet B (UVB) radiation [12]. This process leads to a range of clinical and histological changes, including cutaneous dryness, increased desquamation, epidermal hyperplasia, and a reduction in dermal elasticity. These alterations are commonly accompanied by the formation of wrinkles, solar dermatitis, and telangiectasia [13, 3]. Consequently, anatomical regions with chronic ultraviolet (UV) exposure – such as the face, neck, forearms, and dorsal hands – exhibit accelerated phenotypic markers of cutaneous aging compared to less exposed sites [14]. Given the unavoidable nature of solar exposure, the development of prophylactic interventions to mitigate photo-induced skin aging is essential [15].

In severely photoaged skin, elastic fibres exhibit marked disorganization and are excessively accumulated within the dermis. In cases of mild photoaging, a reduction in fibrillin-rich microfibrils is observed, while intrinsic aging is characterized by the progressive fragmentation of the elastic fibre network [16].

The extracellular matrix (ECM), which plays a fundamental role in maintaining the biomechanical properties and structural cohesion of the skin, is predominantly composed of the key fibrous proteins collagen and proteoglycans. These components are essential for providing mechanical strength, regulating molecular permeability, and maintaining skin hydration [17]. Proteoglycans are key regulators of cellular functions and mediate interactions between cells and the ECM. Moreover, collagen-associated proteoglycans act as critical reservoirs for cytokines and growth factors, and alterations in their expression levels or molecular structure can significantly disrupt tissue homeostasis [17].

Age-related modifications of the ECM include decreased synthesis and fragmentation of collagen fibres, leading to compromised matrix organization. Empirical data suggest that dermal collagen content diminishes by approximately one percent per year, resulting in reduced tensile strength and elasticity of the dermis [18]. These changes manifest clinically as increased wrinkle formation and xerosis of the epidermis [3].

The biological role of collagen in maintaining skin structure and function. Collagen is a structural glycoprotein classified

within the fibrillar collagen family, composed of three polypeptide α-chains arranged in a left-handed configuration that assemble into a right-handed triple-helical structure. Its primary amino acid constituents include glycine, proline, and hydroxyproline, together with hydroxylysine, which collectively contribute to the molecule's thermal stability and biomechanical resilience [19].

In human skin, type I collagen constitutes approximately 80%-90% of the total collagen content, while type III collagen comprises about 8%-12%, and type V collagen approximately 5% [13]. Type I collagen, together with type III, forms the predominant structural framework of the dermis, contributing to nearly 95% of the skin's collagen composition. These fibrillar collagens play a pivotal role in maintaining dermal strength, rigidity and elasticity through the formation of robust extracellular fibre networks. Notably, type III collagen is particularly abundant in developing skin, and is critical for the structural organization and mechanical properties of neonatal and early-life dermal tissue [3].

Collagen production is predominantly mediated by fibroblasts, which are essential for preserving the dermal matrix and contributing to the skin's tensile resilience. The principal molecular mechanism underlying photoaging involves the generation of reactive oxygen species (ROS) as a result of ultraviolet radiation exposure [20]. Oxidative stress, resulting from the excessive accumulation of reactive oxygen species, induces damage to cellular lipids, proteins, nucleic acids, and organelles. This molecular impairment promotes the onset of cellular senescence, a fundamental biological mechanism underlying the progression of skin aging [4]. Additionally, elevated oxidative stress induces fibroblast apoptosis, further diminishing collagen synthesis and contributing to ECM disorganization [13]. The resultant imbalance between collagen degradation and synthesis leads to deterioration of the dermal extracellular matrix, manifesting clinically as wrinkles, fine lines, and diminished skin elasticity [20].

Oral administration of hydrolyzed collagen and its physiological impact. Collagen, the predominant structural protein in mammals, is increasingly recognized for its functional significance and is actively utilized across the nutrition, biomedical, and cosmetic sectors [21]. Collagen can be integrated into dermatological applications through various modalities, including topical formulations designed to support skin hydration and structural integrity.

Topical creams containing collagen aimed at improving skin hydration and enhancing dermal firmness are widely used by numerous subjects. However, due to the large molecular size of collagen and the barrier function of the stratum corneum, transdermal penetration is limited, thereby constraining the efficacy of such treatments [22].

Native collagen, with a molecular mass of approximately 300 kDa and inherently low aqueous solubility, demonstrates limited bioavailability, making direct utilization in biological systems challenging. Through enzymatic hydrolysis, the collagen molecule undergoes controlled cleavage at specific amide bonds, resulting in hydrolyzed collagen composed of peptides with reduced molecular weights in the range of 1–10 kDa. It is rich in specific amino acids, such as hydroxyproline, proline, and glycine [6]. This process not only improves solubility but also significantly enhances intestinal absorption and biological efficacy of the resulting peptides [23].

Following oral administration, hydrolyzed collagen is absorbed in the small intestine in the form of peptides and free amino acids, subsequently entering the systemic circulation and localizing within the dermal layer, where it may persist for up to 14 days [24]. These peptides have been shown to activate dermal fibroblasts, enhancing the biosynthesis of collagen and elastin fibres, while also promoting the endogenous synthesis of collagen, elastin and hyaluronic acid, thereby improving skin hydration and mechanical properties such as elasticity [25,26].

In the pharmaceutical, cosmetic, and food industries, collagen derived from marine sources is increasingly favoured [22]. Marine organisms serve as a rich reservoir of collagen and other bioactive compounds. Compared to terrestrial animal-derived collagen, marine collagen typically exhibits lower molecular weight and enhanced bioavailability. Additionally, it is preferred in industrial applications due to its reduced immunogenicity and minimal contamination risk [23, 6].

Analysed studies. A literature search was conducted using the PubMed database, focusing on articles published between 2018–2024. The search strategy combined key words such as 'oral collagen peptides', 'hydrolyzed collagen', 'skin', 'skin aging,' 'elasticity', 'hydration', with filters applied to restrict results human clinical trials published in English. Only randomized controlled trials (double-blind, single-blind, or triple-blind) and open-label clinical trials were considered. Inclusion criteria: healthy, adult participants (primarily women aged 30–65 years) receiving oral hydrolyzed collagen peptide supplementation, with outcomes assessing skin parameters such as hydration, elasticity, wrinkle depth, roughness, density, or overall skin condition. Exclusion criteria: non-human studies, non-oral collagen interventions (e.g., topical applications), systematic reviews or meta-analyses, studies focused on non-dermatological outcomes, or those involving participants with major chronic illnesses, active skin diseases, pregnancy, or recent cosmetic/dermatological interventions. Based on these criteria, seven clinical studies were identified and analyzed, the majority being randomized, double-blind, placebo-controlled trials.

Critical evaluation of outcomes across the analyzed research. Table 1 presents a summary of clinical trials evaluating the effects of various collagen-based supplements on skin parameters. The trials were predominantly randomized, placebo-controlled and double-blind, with one study utilizing a single-blind protocol, another – triple-blind protocol and another conducted as an open-label trial. Sample sizes ranged from 50–140 participants, aged between 30–65 years. Interventions included different formulations and dosages of collagen, with treatment durations varying from 4–16 weeks. Across studies, the most frequently assessed outcomes were skin elasticity, hydration, roughness, and wrinkling, alongside additional parameters, such as desquamation, whitening, density, radiance, and overall skin quality.

In all of the aforementioned, specific criteria were applied to enable the selection of suitable candidates for participation in the research (Tab. 1).

Inclusion criteria. *Health status* – healthy volunteers with normal physical examination findings and absence

Table 1. Analysis of clinical trials

Type of trial	Subjects (Female/Male)	Excluded	Test/Placebo participants	Age range	Time of evaluation (weeks)	Analysed parameters
Double blind, randomized, placebo-controlled study	120 (120/0)	8	n=57; CollaSel Pro® 10 g collagen/n=55; 0g collagen	35–60	0,1,4,8	Skin elasticity, hydration, roughness
Double blind, randomized, placebo-controlled study	140 (140/0)	40	n = 54; 1650 mg of CPNS/n=46; 0mg of CPNS	30–60	0,4,8,12	Skin hydration, desquamation, wrinkling, and elasticity
Single blind, randomized, placebo-controlled study	70 (72/0)	0	n=36; ELASTEN® 2.5 g collagen peptides/n=36; 0g collagen	>34	0,12,16	Skin elasticity, hydration, roughness, density
Double blind, randomized, placebo-controlled study	100 (63/24* after elimination from the study)	13	n=45; GPVGPS Collagen® 2g collagen in 2,5g tablets/ n=42; 0g collagen in 2,5g tablets	35–60	0,4,8,12	Skin wrinkles, elasticity, hydration, and whitening
Double blind, randomized, placebo-controlled study	70 (70–0)	17	n=26; 1g collagen/n=27; 0g collage	40–60	0,6,12,12 2/7	Skin wrinkles, elasticity, hydration
Triple blind, randomized, placebo- controlled study	50 (50/0)	5	n=21; Vinh Wellness Collagen 10g/ n=24; 0g collagen	45–60	0,6,12	Skin score, wrinkle, elasticity, hydration, radiance, firmness
Open-label clinical trial	135 (135/0)	19	n=116; Verisol® 2.5 g collagen/n=0	45–65	0,4, 8,12	Global wrinkles, skin elasticity skin texture, skin tone evenness, skin radiance and overall skin quality

The studies under analysis are presented in the same sequential order as outlined in Table 1:
I – Efficacy and Safety of CollaSel Pro® Hydrolyzed Collagen Peptide Supplementation without Addons in Improving Skin Health in Adult Females: A Double Blind, Randomized, Placebo-Controlled Clinical Study Using Biophysical and Skin Imaging Techniques [27].
II – Oral intake of collagen peptide NS improves hydration, elasticity, desquamation, and wrinkling in human skin: a randomized, double-blinded, placebo-controlled study [28].
III – A Collagen Supplement Improves Skin Hydration, Elasticity, Roughness, and Density: Results of a Randomized, Placebo-Controlled, Blind Study [29].
IV – Low-molecular-weight collagen peptides supplement promotes a healthy skin: A randomized, double-blinded, placebo-controlled study [30].
V – Oral Intake of Low-Molecular-Weight Collagen Peptide Improves Hydration, Elasticity, and Wrinkling in Human Skin: A Randomized, Double-Blind, Placebo-Controlled Study [15].
VI – A randomized, triple- blind, placebo- controlled, parallel study to evaluate the efficacy of a freshwater marine collagen on skin wrinkles and elasticity [26].
VII – Beneficial Effects of Multi-Micronutrient Supplementation with Collagen Peptides on Global Wrinkles, Skin Elasticity and Appearance in Healthy Female Subjects [31].

of acute or chronic diseases [27,28,29,30,15,26,31], no significant abnormalities in cardiovascular, neurological, musculoskeletal, haematological, hepatic, renal, pulmonary, endocrine, metabolic, or psychiatric status [27, 29, 30, 15].

Skin condition – presence of visible signs of skin aging, such as wrinkles (e.g., crow's feet with a minimum severity score ≥3 or 4), uneven skin tone, dullness, or laxity [28–30, 15, 31].

Haemodynamic stability – normal blood pressure within ranges: SBP 110–140 mmHg, DBP 60–90 mmHg and resting heart rate 50–100 bpm after 5 minutes rest [27].

Compliance and consent – ability to understand study procedures, communicate effectively, and comply with protocol requirements [27, 29, 30, 26], written informed consent provided [27–30,15,26,31]. Additional agreement to avoid prolonged UV exposure during the study [30, 26], BMI within normal or slightly overweight range (20.0–29.9 kg/m^2) [30]

EXCLUSION CRITERIA

Allergies and intolerances – known allergy or hypersensitivity to collagen, test product excipients, or related food substances [27, 29, 30], atopic constitution, asthma, or other allergic disorders [27, 29].

Medical conditions – presence/history of major visceral organ diseases, chronic systemic illnesses (cardiovascular, neurological, endocrine, metabolic, psychiatric) [27, 29, 30, 15], skin diseases affecting the test area or diffuse/active cutaneous disorders [28, 30, 15, 26], porphyria, history of drug abuse, or psychiatric illness [27, 30, 15].

Medication and cosmetics – use of oral retinoids or steroids within six months prior to study [27,29,30], use of topical retinoids, anti-wrinkle products (retinol, AHAs), moisturizing / skincare therapies (laser, peeling) within three months prior [27,29,30,15]; use of systemic corticosteroids, topical immuno-modulators, or oral bioactive substances shortly before start of study [28, 30, 15]; recent cosmetic or dermatological procedures, such as botulinum toxin, fillers, dermabrasion, laser treatment within six months to two years, depending on treatment [26, 28]

Reproductive status – pregnancy or planning pregnancy within study duration [15, 26, 28–31].

Lifestyle and dietary factors – current smoking or recent smoking cessation within one year [15,29], use of contraceptives, female hormones, obesity drugs, absorption inhibitors, anti-depressants, appetite suppressants, or special diets [15, 27, 29, 30], significant body weight fluctuations (loss of 5% body weight compared to baseline [27].

Other factors – tattoos near test area [30], cognitive impairment or inability to provide informed consent [26, 30], any condition judged by the investigator likely to affect safety, compliance, study integrity, or data quality [15, 26–31].

The trials [15, 26–31] demonstrated substantial heterogeneity across several domains that complicate direct comparison of outcomes. Dosages ranged widely, from as little as 1 g / day to 10 g / day, with some products delivered as powders and others in tablet form, raising the possibility of dose-response effects that were not consistently examined. The collagen peptides themselves varied in source and formulation, with marine-derived, freshwater,

porcine, and commercial branded hydrolysates represented. Molecular weight distribution and peptide composition, however, were not uniformly reported, which limited insights into bioavailability differences. Participant demographics also lacked diversity, as most studies enrolled only or predominantly middle-aged women (30–65 years), with little detail on ethnicity, thereby restricting generalizability to broader populations. The study design varied from rigorous double- and triple-blind randomized controlled trials to a single-blind and one open-label trial, introducing potential performance and assessment biases, while one study tested collagen combined with micronutrients, confounding attribution of benefits to collagen alone. Outcome measures were also inconsistent, with hydration, elasticity, and wrinkle depth assessed using different biophysical tools, imaging methods, and self-reported scales, and follow-up intervals ranging from 4–16 weeks, making temporal comparisons difficult. Collectively, these differences in dose, peptide source, demographic representation, blinding, co-interventions, and measurement methods, likely contributed to variability in results and highlight the need for standardized protocols, larger and more diverse populations, and trials designed to isolate collagen-specific effects.

Primary outcomes from the seven clinical trials were assessed using a combination of instrumental, imaging, and subjective methods, with no study employing invasive histological biopsies. The most common instrumental measures were corneometry – to quantify changes in skin hydration, and cutometry – to evaluate elasticity and viscoelastic recovery. Several trials also incorporated additional parameters, such as transepidermal water loss or skin colorimetry. Wrinkle severity and surface topography were primarily assessed through high-resolution 3D-imaging systems or standardized photographic documentation, while two studies additionally employed ultrasound-based imaging to evaluate dermal density as a structural correlate of skin quality. Subjective assessments were consistently included, either through participant self-assessment questionnaires addressing hydration, smoothness, radiance, and overall appearance, or through dermatologist grading scales of wrinkle severity and global skin condition.

Taken together, these outcome measures provided a multi-dimensional evaluation of skin health, though the heterogeneity in tools, scales, and timing of assessments complicates direct comparisons across studies.

In the seven clinical studies analyzed, oral supplementation with hydrolyzed collagen peptides – alone or in combination with other dermonutrients such as hyaluronic acid and micronutrients [31] – consistently demonstrated significant improvements in various indicators of skin aging, including hydration, elasticity, roughness, wrinkle depth, firmness, radiance, and overall skin appearance [15, 26–31]. Benefits were often observed as early as 1–4 weeks for hydration and desquamation [27, 28, 30, 31], with more pronounced effects on elasticity and wrinkle reduction emerging after 8–12 weeks of continuous intake [15, 26–31].

These interventions were well tolerated, with no serious adverse events reported, and safety parameters remaining within normal clinical ranges. Objective dermatological tools (e.g., corneometry, cutometry) and subjective self-assessments confirmed the efficacy and safety of collagen-based supplements in promoting dermal health and mitigating signs of intrinsic and photoaging [15, 26–31].

While the current findings support the role of hydrolyzed collagen, especially fish-derived and glycine-proline-rich formulations, as a viable strategy for improving skin health in aging populations, further long-term and mechanistic studies are warranted. These should include diverse populations (e.g., males, different ethnicities), and explore synergistic effects with other skin-enhancing compounds.

CONCLUSIONS

The cumulative findings from the analyzed randomized, placebo-controlled clinical trials provide robust scientific evidence supporting the role of oral hydrolyzed collagen supplementation as an effective intervention for attenuating age-related cutaneous deterioration. Specifically, the ingestion of low molecular weight collagen peptides -particularly those sourced from marine organisms – was consistently associated with statistically significant improvements in skin biophysical parameters, including hydration, elasticity, density, roughness, and wrinkle depth.

These physiological effects are attributed to the enhanced gastro-intestinal absorption and systemic bio-availability of collagen-derived di- and tripeptides, which preferentially accumulate in the dermis. Once localized, these bioactive peptides stimulate dermal fibroblast proliferation and upregulate the synthesis of key extracellular matrix constituents, such as type I and III collagen, elastin, and glycosaminoglycans, thereby reinforcing skin architecture and biomechanical resilience. Furthermore, the peptides exhibit anti-oxidative and anti-inflammatory properties, contributing to the mitigation of oxidative damage and cellular senescence induced by intrinsic and extrinsic aging processes, notably chronic ultraviolet radiation.

Importantly, all studies reported favourable safety profiles, with no significant adverse events or deviations from physiological norms, underscoring the tolerability and clinical applicability of these compounds. However, variability in peptide source, dosage, study design and outcome assessment, introduces heterogeneity that limits definitive conclusions and complicates direct comparison across trials.

Despite these promising results, limitations remain, including restricted subject demographics (e.g., predominantly middle-aged females), short intervention durations, and heterogeneity in collagen formulations and dosages. Therefore, while current data substantiate the therapeutic potential of hydrolyzed collagen as a dermonutritional strategy for improving cutaneous health and counteracting visible signs of aging, further longitudinal studies are warranted. These should aim to explore mechanistic pathways in greater depth, assess long-term efficacy and safety, and include more diverse populations to better delineate population-specific responses and optimize personalized supplementation regimens.

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