



DERMABIOTICS™

PLANT-BASED REGENERATING SERUM



TECHNICAL DATA SHEET

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*These statements have not been evaluated by the Food and Drug Administration. This product is not intended to diagnose, treat, cure, or prevent any disease.

DermaBiotics™ Regenerating Serum | Technical Data Sheet

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DERMABIOTICS™ PLANT-BASED REGENERATING SERUM

To revitalize skin elasticity and balance...nourish it. This plant-based, all-natural, topical serum delivers targeted prebiotics, probiotics, phytobiotics, and essential sea minerals for healthy, protected, glowing skin.*
#CleanHappyGlow

Ingredients matter. In formulating DermaBiotics™ Plant-Based Regenerating Serum, Amare scientists were selective about what ingredients to include to make the serum effective and clean. The result? A Serum that has been verified by the Environmental Working Group (EWG), whose scientists reviewed the DermaBiotics™ Plant-Based Regenerating Serum formula and compared it to their strict standards to find the serum is free of chemicals of concern and transparently made.

KEY INGREDIENTS

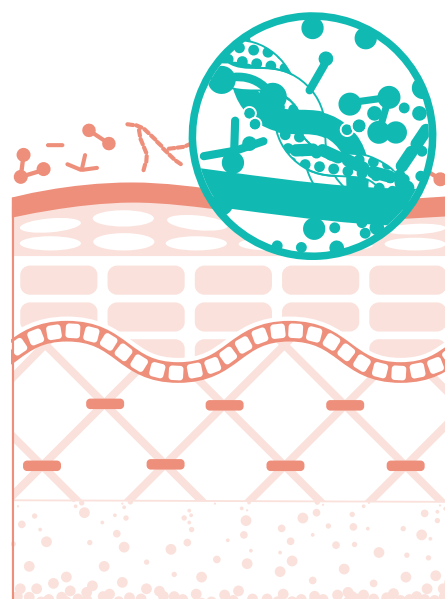
- All-natural topical serum with targeted prebiotics, probiotics, and phytobiotics that directly nourish the skin microbiome.*
- Skin microbiome support: Lactococcus Ferment Lysate (probiotic), Laminaria Digitata & Chlorella Vulgaris (algae phytobiotics).
- Hydrolyzed Soy Fiber (prebiotic), Tocotrienols, Hyaluronic Acid.
- Sea Water mineral blend.

● Balance the Skin Microbiome*

☞ Protect the Skin Barrier*

○ Tone and Smooth Skin*

♥ **Cruelty-Free**
No animal testing. Ever.



DermaBiotics™ Regenerating Serum | Technical Data Sheet

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- i. Lactococcus Ferment Lysate: A probiotic that is known to benefit the skin microbiome by balancing pH and strengthening the skin's integrity.
- ii. Hyaluronic Acid: A chemical your body makes itself and is known as the skin's water well. It keeps your skin hydrated, and moisturized, promoting softness and smoothness, while decreasing the likelihood of wrinkles, dry skin, and aging.
- iii. Hydrolyzed Soy Fiber: Helps retain moisture and revitalizes skin elasticity, while soothing skin and maintaining microflora balance.
- iv. Laminaria Digitata: A seaweed found in the Atlantic Ocean that is known to contain alginates, mannitol and amino acids that help moisturize, re-mineralize, and nourish the skin.
- v. Chlorella Vulgaris: Also derived from an algae and is known to help with firmness and tone by acting as a buffer between the skin's different layers.
- vi. Saccharide Isomerate: Acting as a moisture reservoir, this is a plant-derived moisturizer that binds to the skin for hydration and balance.
- vii. Sea Water: This skin-calming mineral blend is high in magnesium, potassium, and calcium and functions as an exfoliant and supports pore integrity.
- viii. Tocotrienols: This full vitamin E blend functions as an antioxidant and protects skin cells from external damage. Vitamin E is a driver in skin sebum which supports the skin's natural oil and moisturization.
- ix. Linoleic and Linolenic Acid: Containing vitamin K, this fortifies the skin's shield and helps with moisture and plumpness.
- x. Superoxide Dismutase: An enzyme and powerful natural antioxidant that has soothing and calming properties.

VERIFIED BY THE ENVIRONMENTAL WORKING GROUP



Verified by the Environmental Working Group (EWG), this serum has passed the personal care industry's highest standard for clean ingredients. EWG only verifies products that are free of chemicals of concern and transparently produced—it's no surprise that DermaBiotics™ Plant-Based Regenerating Serum passed with flying colors!

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CLINICAL STUDIES

“Probiotics in Cosmetic and Personal Care Products: Trends and Challenges”

Scarlett Puebla-Barragan 1 2, Gregor Reid 1 2

Affiliations expand

PMID: 33652548 PMCID: PMC7956298 DOI: 10.3390/molecules26051249

Probiotics, defined as "live microorganisms that, when administered in adequate amounts, confer a health benefit on the host," are becoming increasingly popular and marketable. However, too many of the products currently labelled as probiotics fail to comply with the defining characteristics. In recent years, the cosmetic industry has increased the number of products classified as probiotics. While there are several potential applications for probiotics in personal care products, specifically for oral, skin, and intimate care, proper regulation of the labelling and marketing standards is still required to guarantee that consumers are indeed purchasing a probiotic product. This review explores the current market, regulatory aspects, and potential applications of probiotics in the personal care industry.

Keywords: cosmetics; lysates; microbiome; probiotics; skin; vaginal health.

<https://pubmed.ncbi.nlm.nih.gov/33652548/>

“Topical Probiotics: More Than a Skin Deep”

Mohammed Habeebuddin,¹ Ranjith Kumar Karnati,² Predeepkumar Narayanappa Shiroorkar,¹ Sreeharsha Nagaraja,^{3,4} * Syed Mohammed Basheeruddin Asdaq,⁵ Md. Khalid Anwer,⁶ and Santosh Fattepur⁷, *

Karin Kogermann, Academic Editor

Author information Article notes Copyright and License information Disclaimer

Abstract

Skin, an exterior interface of the human body is home to commensal microbiota and also acts a physical barrier that protects from invasion of foreign pathogenic microorganisms. In recent years, interest has significantly expanded beyond the gut microbiome to include the skin microbiome and its influence in managing several skin disorders. Probiotics play a major role in maintaining human health and disease prevention. Topical probiotics have demonstrated beneficial effects for the treatment of certain inflammatory skin diseases such as acne,

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rosacea, psoriasis etc., and also found to have a promising role in wound healing. In this review, we discuss recent insights into applications of topical probiotics and their influence on health and diseases of the skin. Patents, commercially available topical probiotics, and novel probiotic impregnated fabrics have been emphasized. A thorough understanding of the relationship between probiotics and the skin microbiome is important for designing novel therapeutic approaches in using topical probiotics.

Keywords: probiotics, inflammatory, microorganisms, dermatitis

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8955881/>

Advantages of Hyaluronic Acid and Its Combination with Other Bioactive Ingredients in Cosmeceuticals

Anca Maria Juncan^{1,2,3,*}, Dana Georgiana Moisă^{3,*}, Antonello Santini⁴, Claudiu Morgovan^{3,*}, Luca-Liviu Rus³, Andreea Loredana Vonica-Tincu³ and Felicia Loghin

Abstract

This study proposes a review on hyaluronic acid (HA) known as hyaluronan or hyaluronate and its derivatives and their application in cosmetic formulations. HA is a glycosaminoglycan constituted from two disaccharides (N-acetylglucosamine and D-glucuronic acid), isolated initially from the vitreous humour of the eye, and subsequently discovered in different tissues or fluids (especially in the articular cartilage and the synovial fluid). It is ubiquitous in vertebrates, including humans, and it is involved in diverse biological processes, such as cell differentiation, embryological development, inflammation, wound healing, etc. HA has many qualities that recommend it over other substances used in skin regeneration, with moisturizing and anti-ageing effects. HA molecular weight influences its penetration into the skin and its biological activity. Considering that, nowadays, hyaluronic acid has a wide use and a multitude of applications (in ophthalmology, arthrology, pneumology, rhinology, aesthetic medicine, oncology, nutrition, and cosmetics), the present study describes the main aspects related to its use in cosmetology. The biological effect of HA on the skin level and its potential adverse effects are discussed. Some available cosmetic products containing HA have been identified from the brand portfolio of most known manufacturers and their composition was evaluated. Further, additional biological effects due to the other active ingredients (plant extracts, vitamins, amino acids, peptides, proteins, saccharides, probiotics, etc.) are presented, as well as a description of their possible toxic effects.

Hyaluronic acid: A key molecule in skin aging

Eleni Papakonstantinou, 1 Michael Roth, 2 and George Karakiulakis 1 ,*

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Abstract

Skin aging is a multifactorial process consisting of two distinct and independent mechanisms: intrinsic and extrinsic aging. Youthful skin retains its turgor, resilience and pliability, among others, due to its high content of water. Daily external injury, in addition to the normal process of aging, causes loss of moisture. The key molecule involved in skin moisture is hyaluronic acid (HA) that has unique capacity in retaining water. There are multiple sites for the control of HA synthesis, deposition, cell and protein association and degradation, reflecting the complexity of HA metabolism. The enzymes that synthesize or catabolize HA and HA receptors responsible for many of the functions of HA are all multigene families with distinct patterns of tissue expression. Understanding the metabolism of HA in the different layers of the skin and the interactions of HA with other skin components will facilitate the ability to modulate skin moisture in a rational manner.

Keywords: hyaluronic acid, hyaluronic acid synthases, hyaluronidases, CD44, RHAMM, skin aging

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3583886/>

Hyaluronic Acid in Inflammation and Tissue Regeneration

Malgorzata Litwiniuk, Alicja Krejner, Marcus S Speyrer, Anibal R Gauto, Tomasz Grzela

Hyaluronic acid (HA), the main component of extracellular matrix, is considered one of the key players in the tissue regeneration process. It has been proven to modulate via specific HA receptors, inflammation, cellular migration, and angiogenesis, which are the main phases of wound healing. Studies have revealed that most HA properties depend on its molecular size. High molecular weight HA displays anti-inflammatory and immunosuppressive properties, whereas low molecular weight HA is a potent proinflammatory molecule. In this review, the authors summarize the role of HA polymers of different molecular weight in tissue regeneration and provide a short overview of main cellular receptors involved in HA signaling. In addition, the role of HA in 2 major steps of wound healing is examined: inflammation and the angiogenesis process. Finally, the antioxidative properties of HA are discussed and its possible clinical implication presented.

<https://pubmed.ncbi.nlm.nih.gov/26978861/>

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“Hyaluronic acid, a promising skin rejuvenating biomedicine: A review of recent updates and pre-clinical and clinical investigations on cosmetic and nutricosmetic effects”

Syed Nasir AbbasBukhariaNur LiyanaRosewandibMuhammadSohailfNor AmlizanRamlibHnin
EiThugZahidHussainb

Abstract

Hyaluronic acid (HA) plays multifaceted role in regulating the various biological processes such as skin repairmen, diagnosis of cancer, wound healing, tissue regeneration, anti-inflammatory, and immunomodulation. Owing to its remarkable biomedical and tissue regeneration potential, HA has been numerously employed as one of the imperative components of the cosmetic and nutricosmetic products. The present review aims to summarize and critically appraise recent developments and clinical investigations on cosmetic and nutricosmetic efficacy of HA for skin rejuvenation. A thorough analysis of the literature revealed that HA based formulations (i.e., gels, creams, intra-dermal filler injections, dermal fillers, facial fillers, autologous fat gels, lotion, serum, and implants, etc.) exhibit remarkable anti-wrinkle, anti-nasolabial fold, anti-aging, space-filling, and face rejuvenating properties. This has been achieved via soft tissue augmentation, improved skin hydration, collagen and elastin stimulation, and face volume restoration. HA, alone or in combination with lidocaine and other co-agents, showed promising efficacy in skin tightness and elasticity, face rejuvenation, improving aesthetic scores, reducing the wrinkle scars, longevity, and tear trough rejuvenation. Our critical analysis evidenced that application/administration of HA exhibits outstanding nutricosmetic efficacy and thus is warranted to be used as a prime component of cosmetic products.

“Role of Hyaluronic Acids and Potential as Regenerative Biomaterials in Wound Healing”

Hao Yang, Liu Song, Yifang Zou, Dandan Sun, Limei Wang, Zhuo Yu, and Jianfeng Guo*

Abstract

The skin can protect the body from external harm, sense environmental changes, and maintain physiological homeostasis. Cutaneous repair and regeneration associated with surgical wounds, acute traumas, and chronic diseases are a central concern of healthcare. Patients may experience the failure of current treatments due to the complexity of the healing process; therefore, emerging strategies are needed. Hyaluronic acids (HAs, also known as hyaluronan), a glycosaminoglycan (GAG) of the extracellular matrix (ECM), play key roles in cell differentiation, proliferation, and migration throughout tissue development and regeneration. Recently, HA derivatives have been developed as regenerative biomaterials for treating skin damage and injury. In this review, the healing process, namely, hemostasis, inflammation, proliferation, and maturation, is described and the role of HAs in the healing process is discussed. This review also provides recent examples in the development of HA derivatives for wound healing.

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“Hyaluronic acid as a bioactive component for bone tissue regeneration: Fabrication, modification, properties, and biological functions”

Fei Xing, Changchun Zhou, Didi Hui, Colin Du, Lina Wu, Linnan Wang, Wenzhao Wang, Xiaobing Pu, Linxia Gu, Lei Liu, Zhou Xiang and Xingdong Zhang

Abstract

Hyaluronic acid (HA) is widely distributed in the human body, and it is heavily involved in many physiological functions such as tissue hydration, wound repair, and cell migration. In recent years, HA and its derivatives have been widely used as advanced bioactive polymers for bone regeneration. Many medical products containing HA have been developed because this natural polymer has been proven to be nontoxic, noninflammatory, biodegradable, and biocompatible. Moreover, HA-based composite scaffolds have shown good potential for promoting osteogenesis and mineralization. Recently, many HA-based biomaterials have been fabricated for bone regeneration by combining with electrospinning and 3D printing technology. In this review, the polymer structures, processing, properties, and applications in bone tissue engineering are summarized. The challenges and prospects of HA polymers are also discussed.

Keywords: [bioactive component](#); [hyaluronic acid](#); [bone regeneration](#); [3D printing](#); [tissue engineering](#)

Enhancement of nutritional soy protein and peptide supplementation on skin repair in rats

[JianZhangaXiaohangFuaWenhuiLiaHeLiaZhiweiYingaXinqiLiuaLiduanYinb](#)

Abstract

The aim of this study was to assess the effect of soy protein and soy peptide on skin repair process in male Wistar rats. Soy protein and soy peptide were administered orally by gavage to the rats post-operatively for 16 days. The supplementation of soy protein and soy peptide resulted in improvement of leucocytes production, decrease in serum inflammation index (IL-1 β , IL-6, TNF- α) as well as increase of plasma protein concentration. Additionally, the excessive production of inflammatory factors in peptide group were significantly suppressed compared with the protein group at day 4, which indicated that soy peptide had a better impact on promoting the process of skin repair. Histopathological analysis indicated that peptide group performed better on fibroblast proliferation and collagen synthesis than the protein group, and eventually manifests as more collagen deposition and a better skin repair rate. In conclusion, soy peptide displayed the potential to promote skin regeneration.

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“Topical Peptide Treatments with Effective Anti-Aging Results”

by Silke Karin Schagen

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Academic Editor: Marie Loden

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In the last two decades, many new peptides have been developed, and new knowledge on how peptides improve the skin has been uncovered. The spectrum of peptides in the field of cosmetics is continuously growing. This review summarizes some of the effective data on cosmeceutical peptides that work against intrinsic and extrinsic aging. Some peptides have been proven in their efficacy through clinical skin trials. Well-known and documented peptides like copper tripeptide are still under research to obtain more details on their effectiveness, and for the development of new treatments. Palmitoyl pentapeptide-4 and Carnosine are other well-researched cosmeceuticals. Additionally, there are many more peptides that are used in cosmetics. However, study results for some are sparse, or have not been published in scientific journals. This article summarizes topical peptides with proven efficacy in controlled in vivo studies. [View Full-Text](#)

Keywords: [barrier function](#); [anti-aging](#); [skin care](#); [peptides](#); [clinical studies](#)

Effects of soybean peptide and collagen peptide on collagen synthesis in normal human dermal fibroblasts

January 2012

International Journal of Food Sciences and Nutrition 63(6):689-95 DOI:10.3109/09637486.2011.652597

Source PubMed

The collagen present in the dermis of the skin is a fibrous protein that fills the gaps between cells and helps maintain tissue flexibility. Effectively increasing the collagen present in the skin is an important goal for cosmetic research. Recent research has shown that soybean peptide (SP) has anti-fatigue activity, antioxidant activity, and the ability to increase type I collagen, while collagen peptide (CP) has the ability to enhance corneal moisture content and viscoelasticity, as well as to increase levels of hyaluronic acid synthesizing enzymes in human skin. Little documented research, however, has been conducted on collagen formation in relation to these peptides. Therefore, this research applied SP and CP with molecular weights primarily around 500

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and preparations containing both SP and CP to normal human dermal fibroblasts together with magnesium ascorbyl phosphate (VC-PMg), and used real-time PCR to determine the gene expression of type I collagen (COL1A1), which contributes to collagen synthesis, and Smad7, which contribute to collagen breakdown. In addition, enzyme linked immuno sorbent assay (ELISA) was used to measure collagen content in the media. COL1A1 gene expression at 24 h after sample addition showed higher tendency in all samples and increased with time at 4, 8 and 24 h after addition. Smad7 gene expression was not substantially different at 4 h after addition. matrix metalloproteinase-1 gene expression was higher following SP addition, but was lower after the addition of CP and SP+CP. Medium collagen content was higher in all samples and increased with time at 8 h after addition. Collagen levels were higher when SP and CP were added together.

A novel topical ingredient derived from seaweed significantly reduces symptoms of acne vulgaris: A general literature review

June 2013 Journal of Cosmetic Science 64(3):219-26

Source PubMed

Abstract

Currently, benzoyl peroxide, antibiotics, and retinoids are the mainstay topical treatments for acne vulgaris. However, potential benefits may be offered by natural, marine-derived ingredients, such as those derived from brown seaweed (*Laminaria digitata*). This article will review the available literature on two ingredients; "seaweed oligosaccharides," which are those derived from the polysaccharide membrane of *Laminaria digitata*, and a novel seaweed oligosaccharide-zinc complex (SOZC) (Phycosaccharide AC, The Mentholatum Company, East Kilbride, UK). Findings from a recent double-blind, placebo-controlled, randomized clinical trial (RCT) will also be reported and likely mechanisms discussed. The findings taken together suggest that SOZC can significantly ameliorate symptoms of acne vulgaris, particularly in terms of reducing sebum production and populations of *Propionibacterium acnes*.

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Antioxidant and Antiaging Properties of Agar Obtained from Brown Seaweed *Laminaria digitata* (Hudson) in D-Galactose-Induced Swiss Albino Mice

B. S. Reshma, 1 Thabitha Aavula, 1 Vignesh Narasimman, 1 Saravanan Ramachandran, 1 Musthafa Mohamed Essa, 2 and M. Walid Qoronfleh 3

Abstract

The present paper explores the antioxidant and antiaging properties of agar extracted from *Laminaria digitata* (L. digitata) on a D-galactose (D-Gal)-induced mouse model. Experimental mice were divided into four groups: group I comprised of control nontreated mice, group II comprised of D-Gal-induced mice, group III mice were treated with extracted agar after D-Gal induction, and group IV mice were given ascorbic acid as a positive control. Antioxidant enzymes and aging marker proteins declined significantly in group II, whereas they were normal in group III and group IV mice. Expressions of interleukin-1 β (IL-1 β) in D-Gal-induced mice were significantly enhanced in the liver and brain of the experimental mice, which were otherwise normal in agar-treated mice. Also, IL-6 levels were significantly increased in the liver and reversed in the brain of D-gal mice, while it was regularly in the agar-treated mice. The histopathological analysis of D-Gal-induced mice showed spongiosis and tangles in brain cells, increased fat and decreased collagen contents in the skin, and few dilated sinuses in the hepatic cells. The changes were under control in group III and group IV mice, suggesting the protective effects of agar extracted from L. digitata and ascorbic acid.

“Seaweeds as Source of Bioactive Substances and Skin Care Therapy—Cosmeceuticals, Algotherapy, and Thalassotherapy”

by Leonel PereiraORCID

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Abstract

Riverine, estuarine, and coastal populations have always used algae in the development of home remedies that were then used to treat diverse health problems. The empirical knowledge of various generations originated these applications, and their mechanism of action is, in most cases, unknown, that is, few more scientific studies would have been described beyond simple collection and ethnographic recording. Nevertheless,

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recent investigations, carried out with the purpose of analyzing the components and causes that alter the functioning and the balance of our organism, are already giving their first results. Water, and especially sea water is considered as essential to life on our planet. It sings all the substances necessary and conducive to the development of the living being (minerals, catalysts, vitamins, amino acids, etc.). Oceans cover over 70% of Earth, being home to up to 90% of the organisms in the planet. Many rich resources and unique environments are provided by the ocean. Additionally, bioactive compounds that multiple marine organisms have a great potential to produce can be used as nutraceuticals, pharmaceuticals, and cosmeceuticals. Both primary and secondary metabolites are produced by algae. The first ones are directly implicated in development, normal growth, or reproduction conditions to perform physiological functions. Stress conditions, like temperature changes, salinity, environmental pollutants, or UV radiation exposure cause the performance of secondary metabolites. In algae, proteins, polysaccharides, fatty acids, and amino acids are primary metabolites and phenolic compounds, pigments, vitamins, sterols, and other bioactive agents, all produced in algae tissues, are secondary metabolites. These algal active constituents have direct relevance in cosmetics.

Effects of seaweed *Laminaria japonica* extracts on skin moisturizing activity in vivo

Jae-Suk Choi 1, Woi Sook Moon, Ji Na Choi, Kee Hun Do, Sun Hwa Moon, Kwang Keun Cho, Chae-Jeong Han, In Soon Choi

PMID: 23752034

Abstract

Twelve species of edible seaweed from the coast of Korea were screened for skin moisturizing activity. We placed the lead of a Corneometer on an approximately 6-cm² test area of the forearm and measured both untreated skin (control) and skin treated with test moisturizing creams either containing or not containing 5% water:propylene glycol (50:50) extracts of seaweeds. Over the 8-h observation period, the strongest activity of the *Laminaria japonica* extracts occurred at the 2-h period. For the 10% extract, hydration with the *L. japonica* extract increased by 14.44% compared with a placebo. Transepidermal water loss (TEWL) was also measured using a test cream with 10% *L. japonica* extract. For up to 8 h after applying the creams, TEWL was decreased to 4.01 g/cm², which was approximately 20% of that seen with the control. We suggest that the *L. japonica* extract hydrates skin via the humectants and hydrocolloids that it contains. To confirm the safety of *L. japonica* extracts, we performed a patch test on human skin. The results suggested that at moderate doses humans can safely use the extracts. For commercial applications, we evaluated the physicochemical characteristics of the test cream products, including Hunter L, a, and b values; pH; refractive index; and coefficient of viscosity. *L. japonica* extract did not affect overall formulations of the test cream product in any of the tested aspects. These results suggest that *L. japonica* extract is a promising ingredient in moisturizing formulations.

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“The extraction of antioxidants from *Chlorella vulgaris* for Cosmetics”

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Abstract

Chlorella vulgaris is microalgae that contain chlorophyll as antioxidants, which has been widely used as a functional food. Antioxidants from *Chlorella vulgaris* also have potential as active ingredients in the cosmetics industry. Nowadays, consumers prefer natural cosmetics because they aren’t harmful to the skin. This study aimed to obtain chlorophyll antioxidants from *Chlorella vulgaris* and applied it to the cosmetics. The extraction process of antioxidants from *Chlorella vulgaris* was performed by maceration method, with *Chlorella vulgaris* concentration variable: 0.01; 0.05 and 0.1% in water as solvent. The antioxidant extracts powdered by spray drying method, with addition of 100 g/L maltodextrin. The observation was conducted on the characteristics of water content, ash content, carbohydrate content, protein content, antioxidant activity, and powder morphology. The extracts powder applied to cosmetics in the form of creams and lotions, then characterized for the antioxidant activity and microbial content. The best antioxidant capacity of extract powder was obtained on *Chlorella vulgaris* concentration 0.1%, which was 11.83 mg Vit C per 100 g sample. The results of antioxidant capacity in cosmetics as cream and lotion were 4.95 mg Vit. C per 100 g sample (IC₅₀ 719.75 mg/ml) and 4.73 mg Vit. C per 100 g sample (IC₅₀ 660 mg/ml), respectively. Both of cream and lotion weren’t shown any microbial contamination. Based on this study, *Chlorella vulgaris* with its antioxidant capacity can be developed as active ingredients for various kinds of cosmetics.

“Effects of *Chlorella* extract on skin”

Pierre-Yves Morvan and Romuald Vallee – Codif International, France

Abstract

This article provides the data obtained on an extract of the micro-algal *Chlorella vulgaris*, which was developed and named Dermochlorella. Some data were already known, and others were obtained after new in vitro tests on different skin cells and clinical tests made on skin microcirculation, skin restructuring and skin protection against UV irradiations. All these data conclude that *Chlorella vulgaris* is a useful cosmetic ingredient for antiageing, anti-wrinkle, anti-cellulite.

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A Novel Tripeptide Derived from *Chlorella vulgaris* Regulates Skin Homeostasis Through Antioxidant Activity

Authors: Han, Jae Gap; Kulkarni, Atul; Jeon, Jin Young; Kim, Bo Ra; Song, Mi Young; Jeong, Hee Yong; Yang, Dong Joo; You, Seung Hun; Kim, Ki Woo; Moh, Sang Hyun; Hwang, Jae-Kwan

Source: Science of Advanced Materials, Volume 7, Number 11, November 2015, pp. 2476-2480(5)

Abstract

The marine green alga *Chlorella vulgaris* produces secondary metabolites including functional nutrients and associated bioactive peptides for protection against harmful environmental stress, suggesting that *C. vulgaris* extracts may be beneficial for skin homeostasis via protection against UV radiation and reactive oxygen species (ROS). In this study, we identified a cysteine-alanine-serine (CAS) tripeptide from *C. vulgaris* using LC-MS/MS and NMR and investigated whether the CAS tripeptide can protect skin cells from ROS species. CAS tripeptide was added to a human skin cell line and this treatment resulted in the upregulation of antioxidant genes. In addition, we identified significant induction of procollagen C endopeptidase enhancer (PCOLCE) protein production, which is related to skin firming, due to exposure to CAS tripeptide. The combined results suggest that the microalgae-derived CAS tripeptide might be a valuable biomaterial for modulation of skin homeostasis through antioxidant activity.

“Regeneration and maturation of daughter cell walls in the autospore-forming green alga *Chlorella vulgaris* (Chlorophyta, Trebouxiophyceae)”

Maki Yamamoto 1, Mariko Fujishita, Aiko Hirata, Shigeyuki Kawano

PMID: 15108033

DOI: 10.1007/s10265-004-0154-6

Abstract

Cell-wall synthesis in *Chlorella vulgaris*, an autospore-forming alga, was observed using the cell wall-specific fluorescent dye Fluostain I. The observation suggested two clearly distinguishable stages in cell-wall synthesis: moderate synthesis during the cell-growth process and rapid synthesis at the cell-division stage. We used electron microscopy to examine the structural changes that occurred with growth in the premature daughter cell wall during the cell-growth and cell-division phases. The cell began to synthesize a new daughter cell wall shortly after its release from the autosporangium. A very thin daughter cell wall, with a thickness of about 2 nm, was formed inside the mother cell wall and completely enveloped the outer surface of the plasma membrane of the cell. The daughter cell wall gradually increased in thickness from 2 to 3.8 nm. During the protoplast-division phase in the cell-division stage, the daughter cell wall expanded on the surface of the

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invaginating plasma membrane of the cleavage furrow, accompanied by active synthesis of the cell wall, which increased in thickness from 3.8 to 6.1 nm. The daughter cell matured into an autospore while completely enclosed by its own thickening (from 6.1 to 17 nm) wall. Finally, the released daughter cell was enclosed by its own cell wall after the mother cell wall burst. The daughter cell with mature wall thickness (17-21 nm) emerged as a small, but complete, autospore.

Chlorella vulgaris Improves the Regenerative Capacity of Young and Senescent Myoblasts and Promotes Muscle Regeneration

Nurhazirah Zainul Azlan,^{1,2} Yasmin Anum Mohd Yusof,¹ Ekram Alias,¹ and Suzana Makpol¹

Abstract

Sarcopenia is characterized by the loss of muscle mass, strength, and function with ageing. With increasing life expectancy, greater attention has been given to counteracting the effects of sarcopenia on the growing elderly population. *Chlorella vulgaris*, a microscopic, unicellular, green alga with the potential for various pharmaceutical uses, has been widely studied in this context. This study is aimed at determining the effects of *C. vulgaris* on promoting muscle regeneration by evaluating myoblast regenerative capacity in vitro. Human skeletal myoblast cells were cultured and underwent serial passaging into young and senescent phases and were then treated with *C. vulgaris*, followed by the induction of differentiation. The ability of *C. vulgaris* to promote myoblast differentiation was analysed through cellular morphology, real-time monitoring, cell proliferation, senescence-associated β -galactosidase (SA- β -gal) expression, myogenic differentiation, myogenin expression, and cell cycle profiling. The results obtained showed that senescent myoblasts exhibited an enlarged and flattened morphology, with increased SA- β -gal expression, reduced myogenic differentiation, decreased expression of myogenin, and an increased percentage of cells in the phase. Treatment with *C. vulgaris* resulted in decreased SA- β -gal expression and promotion of myogenic differentiation, as observed via an increased fusion index, maturation index, myotube size, and surface area and an increased percentage of cells that stained positive for myogenin. In conclusion, *C. vulgaris* improves the regenerative capacity of young and senescent myoblasts and promotes myoblast differentiation, indicating its potential to promote muscle regeneration.

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“The Effect of a Moisturizing Cream Containing Saccharide Isomerate and Ceramide on Reducing Transepidermal Water Loss in Eczema”

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Universitas Prima Indonesia

Abstract

Dermatitis is a disorder of dry skin or a state of skin sensitization due to exposure to external substances. Moisturizing treatments can reduce TEWL (transepidermal water loss). This study is aimed to determine the effectiveness of using moisturizing creams that contain saccharide isomerates and ceramide to reduce TEWL in eczema sufferers. The moisturizing creams have been applied in the lower limbs of eczema sufferers as subjects. The research subjects were 12 people for each group, namely the Saccharide Isomerates (SI), nonSI, Ceramide (S) and non-S. Tewameter/Corneometer 350 treatment used to measure TEWL values before treatment (Week 0) and after treatment (Week II). Data analysis using the unpaired t-test. The results showed that the use of moisturizing creams containing saccharide isomerates and moisturizing creams containing ceramide effectively reduced the TEWL value in eczema sufferers ($p = 0.032$).

“Microbial Reference Frames Reveal Distinct Shifts in the Skin Microbiota after Cleansing”

Riccardo Sfriso^{1,*†} and Joshua Claypool^{2,†}

Abstract

Skin cleansing represents a process of mechanical and chemical removal of dirt, pollutants as well as microbiota from the skin. While skin cleansing can help maintain good health, protect us from infections, illnesses and ailments, skin cleansing can also strip away lipids and moisture from the skin, leading to irritation, barrier impairment and disturbance of the delicate cutaneous microbiome. This study investigated how skin cleansing impacts skin's microbial composition. Thirty Caucasian women were enrolled in a placebo controlled clinical study where participants applied on their volar forearms a liquid body wash twice daily for 1 week in order to mimic frequent showering. Skin microbiome samples were collected by swabbing at defined timepoints and 16S rRNA sequencing was performed. Using “reference frames”, we could identify shifts in the microbial composition and several microbiota were identified as being characteristically associated with the presence of saccharide isomerate, a well-known skin moisturizer. The microbial shift was quite immediate, and we could observe it already at 1 h post cleansing. Interestingly, the new microbial composition reached a certain dynamic equilibrium at day 1 which was then maintained until the end of the study. *Paracoccus marcusii*, a

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potentially beneficial carotenoid-producer microorganism, was enriched by the active treatment and, at the same time, the abundance of several potential pathogenic taxa, *Brevibacterium casei* and *Rothia mucilaginosa*, diminished.

Potential Health Benefits of Deep Sea Water: A Review

[Samihah Zura Mohd Nani](#), 1, 2, 3, * [F. A. A. Majid](#), 2, 3, 4 [A. B. Jaafar](#), 2, 5 [A. Mahdzir](#), 1, 2 and [M. N. Musa](#) 2
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Abstract

Deep sea water (DSW) commonly refers to a body of seawater that is pumped up from a depth of over 200m. It is usually associated with the following characteristics: low temperature, high purity, and being rich with nutrients, namely, beneficial elements, which include magnesium, calcium, potassium, chromium, selenium, zinc, and vanadium. Less photosynthesis of plant planktons, consumption of nutrients, and organic decomposition have caused lots of nutrients to remain there. Due to this, DSW has potential to become a good source for health. Research has proven that DSW can help overcome health problems especially related to lifestyle-associated diseases such as cardiovascular disease, diabetes, obesity, cancer, and skin problems. This paper reviews the potential health benefits of DSW by referring to the findings from previous researches.

Sea water salts: Effect on inflammatory skin disease - An overview

June 2004

[Dermatologie in Beruf und Umwelt](#) 52(2):62-66

[I. Lee](#)

[Howard I Maibach](#)

[University of California, San Francisco](#)

Abstract

Objective: To review the effect of sea water salts on inflammatory skin diseases to explore their clinical value as adjuvant therapy. Data Sources: MEDLINE searches from January 1966 through November 2003 and Science

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Citation Index searches from January 1974 through November 2003 were conducted. Study selection: In vivo and in vitro controlled studies were used. Data extraction: The experimental design, controls, and statistical analysis were of primary importance. Data synthesis: Sea water salts seem to provide a therapeutic benefit in inflammatory skin diseases such as psoriasis, atopic dermatitis, and irritant contact dermatitis. Specifically, sodium, potassium, magnesium, strontium, selenium, and bromide ions seem to confer anti-inflammatory effects. Conclusions: While sea water salts seem to be a promising treatment modality, the active component that accounts for its therapeutic effect remains sub judice. Further studies are necessary to elucidate whether the ion character or the osmolality of the sea water explain sea water's therapeutic effect.

Efficacy of topically applied tocopherols and tocotrienols in protection of murine skin from oxidative damage induced by UV-irradiation

[C Weber¹](#), [M Podda](#), [M Rallis](#), [J J Thiele](#), [M G Traber](#), [L Packer](#)

PMID: 9119243

DOI: 10.1016/s0891-5849(96)00346-2

Abstract

To assess the efficacy of various forms of vitamin E in protection of skin from UV-light-induced oxidative stress, vitamin E (tocotrienol-rich fraction of palm oil, TRF) was applied to mouse skin and the contents of antioxidants before and after exposure to UV-light were measured. Four polypropylene plastic rings (1 cm²) were glued onto the animals' backs, and 20 microliters 5% TRF in polyethylene glycol-400 (PEG) was applied to the skin circumscribed by two rings and 20 microliters PEG to the other two rings. After 2 h, the skin was washed and half of the sites were exposed to UV-irradiation (2.8 mW/cm² for 29 min: 3 MED). TRF treatment (n = 19 mice) increased mouse skin alpha-tocopherol 28 +/- 16-fold, alpha-tocotrienol 80 +/- 50-fold, gamma-tocopherol 130 +/- 108-fold, and gamma-tocotrienol 51 +/- 36-fold. A significantly higher percentage of alpha-tocopherol was present in the skin as compared with that in the applied TRF. After UV-irradiation, all vitamin E forms decreased significantly (p < .01), while a larger proportion of the vitamin E remained in PEG-treated (approximately 80%) compared with TRF-treated (approximately 40%) skin. Nonetheless, vitamin E concentrations in irradiated TRF-treated skin were significantly higher than in the nonirradiated PEG-treated (control) skin (p < .01). Thus, UV-irradiation of skin destroys its antioxidants: however, prior application of TRF to mouse skin results in preservation of vitamin E.

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The 'vitamin E regeneration system' (VERS) and an algorithm to justify antioxidant supplementation in diabetes--a hypothesis

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PMID: 17959321

DOI: 10.1016/j.mehy.2007.07.048

Abstract

In studies of vitamin E effectiveness in diabetes, there are still controversies surrounding negative observational and positive experimental results. However, there is no controversy that antioxidant vitamin E is regenerated from its pro-oxidant tocopheroxyl radical by a network of interacting co-antioxidants. The network of interacting co-antioxidants has only been studied individually. The hypothesis we propose is that a vitamin E regeneration system (VERS) model based on the complex interactions of the co-antioxidants provides a rationale for vitamin E supplementation as a therapeutic adjunct in diabetes. Furthermore, the factors considered prior to the use of Vitamin E as a supplement in diabetes research and therapy, the effectiveness of vitamin E supplementation and the limitations have been identified in the literature. There is no single study of vitamin E supplementation or efficacy that has determined vitamin E levels in combination with all of the co-antioxidants that interact to regenerate oxidised vitamin E. Therefore, there is a lack of good evidence for or against vitamin E being unilaterally depleted in the antioxidant network. There is also lack of rationale for choice of co-antioxidant supplementation. In essence, the normal conditions for effective antioxidant activity of vitamin E supplementation have yet to be fully explored. We propose a coherent model of VERS, and recommend that VERS status needs to be assessed, as part of evidence-based clinical practice to determine whether vitamin E should be recommended for the diabetic patient. We also propose an algorithm, based on the antioxidant activity and confounding factors, to guide the formulation of a credible hypothesis for clinical trials in assessing the function of vitamin E and treatment outcomes. The proposed model hinges on pertinent questions that have to be addressed to avoid organising a clinical trial that has been identified as biased.

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Superoxide Dismutase Administration: A Review of Proposed Human Uses

[C Weber¹](#), [M Podda](#), [M Rallis](#), [J J Thiele](#), [M G Traber](#), [L Packer](#)

[Arianna Carolina Rosa,^{1,*}](#) [Daniele Corsi,¹](#) [Niccolò Cavi,¹](#) [Natascia Bruni,²](#) and [Franco Dosio¹](#)

Farid Chemat, Academic Editor

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Associated Data

[Data Availability Statement](#)

Abstract

Superoxide dismutases (SODs) are metalloenzymes that play a major role in antioxidant defense against oxidative stress in the body. SOD supplementation may therefore trigger the endogenous antioxidant machinery for the neutralization of free-radical excess and be used in a variety of pathological settings. This paper aimed to provide an extensive review of the possible uses of SODs in a range of pathological settings, as well as describe the current pitfalls and the delivery strategies that are in development to solve bioavailability issues. We carried out a PubMed query, using the keywords “SOD”, “SOD mimetics”, “SOD supplementation”, which included papers published in the English language, between 2012 and 2020, on the potential therapeutic applications of SODs, including detoxification strategies. As highlighted in this paper, it can be argued that the generic antioxidant effects of SODs are beneficial under all tested conditions, from ocular and cardiovascular diseases to neurodegenerative disorders and metabolic diseases, including diabetes and its complications and obesity. However, it must be underlined that clinical evidence for its efficacy is limited and consequently, this efficacy is currently far from being demonstrated.

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Superoxide Dismutase 1 Inhibits Alpha-Melanocyte Stimulating Hormone and Ultraviolet B-Induced Melanogenesis in Murine Skin

[Chang Taek Oh^{1,4},* Dohyun Lee^{2,*} Kyotan Koo² Jay Lee³ Ho Sang Yoon⁵ Yoo Mi Choi⁶ Tae-Rin Kwon^{1,4} and Beom Joon Kim^{1,4}](#)

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Abstract

Over the last decade, the incidence of ultraviolet B (UVB)-related skin problems has increased. Oxidative stress caused by UVB induces the secretion of melanocyte growth and activating factors from keratinocytes, which results in the formation of cutaneous hyperpigmentation. Therefore, increasing the antioxidant abilities of skin cells is thought to be a beneficial strategy for the development of sunscreen agents. Superoxide dismutase 1 (SOD1) is an antioxidant enzyme that is known to exhibit antioxidant properties.

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Skin protective and regenerative effects of RM191A, a novel superoxide dismutase mimetic

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PMID: 33202300

PMCID: [PMC7677716](#)

DOI: [10.1016/j.redox.2020.101790](#)

Abstract

Superoxide dismutase (SOD) is known to be protective against oxidative stress-mediated skin dysfunction. Here we explore the potential therapeutic activities of RM191A, a novel SOD mimetic, on skin. RM191A is a water-soluble dimeric copper (Cu²⁺-Cu³⁺)-centred polyglycine coordination complex. It displays 10-fold higher superoxide quenching activity compared to SOD as well as significant antioxidant, anti-inflammatory and immunomodulatory activities through beneficial modulation of several significant inflammatory cytokines in vitro and in vivo. We tested the therapeutic potential of RM191A in a topical gel using a human skin explant model and observed that it significantly inhibits UV-induced DNA damage in the epidermis and dermis, including cyclobutane pyrimidine dimers (CPD), 8-oxo-guanine (8-oxoG) and 8-nitroguanine (8NGO). RM191A topical gel is found to be non-toxic, non-teratogenic and readily distributed in the body of mice. Moreover, it significantly accelerates excisional wound healing, reduces 12-O-tetradecanoylphorbol-13-acetate (TPA)-induced inflammation and attenuates age-associated oxidative stress in skin, demonstrating both skin regenerative and geroprotective properties of RM191A.

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Copper/Zinc-Superoxide Dismutase in Human Epidermis: An Immunochemical Study

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Abstract

The localization of copper and zinc-superoxide dismutase in normal and neoplastic human skin was examined with immunochemical techniques. Skin samples were taken from males and females of different ages, UV exposed and non-exposed areas and basal-/spino-cellular carcinomas. The enzyme was localized diffusely in the cytoplasm and was also found in the nuclei of epidermal cells, endothelial cells and other dermis cell types. The dismutase content in the epidermis was higher in males than females, UV-exposed than non-exposed and young than old people. In the tumors, the enzyme content of the superficial epidermal layers was higher than in the deep tumoral epithelial cells. These data suggest that the localization of Cu, Zn-SOD in skin tissues reflects the gender and age of the subject, the cell types and their normal or diseased state. Further studies based on the investigation of systemic changes of this enzyme in physiological and pathological epidermis could provide additional information on tumor cell generation.

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Insights into superoxide dismutase 3 in regulating biological and functional properties of mesenchymal stem cells

[Shyam Kishor Sah,](#)
[Gaurav Agrahari &](#)
[Tae-Yoon Kim](#)

[Cell & Bioscience](#) volume **10**, Article number: 22 (2020) [Cite this article](#)

3592 Accesses

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Abstract

Mesenchymal stem cells (MSCs) have been extensively studied and implicated for the cell-based therapy in several diseases due to their immunomodulatory properties. Embryonic stem cells and induced-pluripotent stem cells have either ethical issues or concerns regarding the formation of teratomas, introduction of mutations into genome during prolonged culture, respectively which limit their uses in clinical settings. On the other hand, MSCs also encounter certain limitation of circumscribed survival and reduced immunomodulatory potential during transplantation. Plethora of research is undergoing to improve the efficacy of MSCs during therapy. Several compounds and novel techniques have been employed to increase the therapeutic potency of MSCs. MSCs secreted superoxide dismutase 3 (SOD3) may be the mechanism for exhibiting direct antioxidant activities by MSCs. SOD3 is a well known antioxidant enzyme and recently known to possess immunomodulatory properties. Along with superoxide scavenging property, SOD3 also displays anti-angiogenic, anti-chemotactic and anti-inflammatory functions in both enzymatic and non-enzymatic manners. In this review, we summarize the emerging role of SOD3 secreted from MSCs and SOD3's effects during cell-based therapy.

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Reactive Oxygen Species in Skin Repair, Regeneration, Aging, and Inflammation

Hui Xu, Yun-Wen Zheng, Qi Liu, Li-Ping Liu, Feng-Lin Luo, Hu-Chen Zhou, Hiroko Isoda, Nobuhiro Ohkohchi and Yu-Mei Li

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Abstract

As the most important and largest surface barrier, the skin provides a necessary protection to the organism from the external factors, including chemical, biological, and physical irritation, injury, and others. External environmental irritants or their metabolites are inherent oxidants and/or directly or indirectly drive the production of various reactive oxidants, reactive oxygen species (ROSs), owing to the redox imbalances. ROSs, the most common free oxygen radicals, participate in a series of physiological and pathological skin processes. Here, we discussed the role of oxidative events in injury, repair, photoaging, and cutaneous disease development. Intrinsic and extrinsic factors lead to the skin barrier damage, which leads to the disequilibrium in oxidant and antioxidant balance and induces excessive ROS production. The underlying mechanisms include DNA damage, MAPK/AP-1, NF- κ B, and JAK/STAT-signaling pathways, apoptosis and autophagy, and autoimmune reaction of melanocytes and keratinocytes. The skin employs a number of antioxidant agents to protect the oxidative balance, such as superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GSH-Px), ascorbic acid, and tocopherols. The results presented here indicate that antioxidant treatments may be effective when applied in the therapy of cutaneous diseases where oxidative stress plays a prominent pathogenic role.

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Anti-Inflammatory and Skin Barrier Repair Effects of Topical Application of Some Plant Oils

[Tzu-Kai Lin,¹](#) [Lily Zhong,^{2,*}](#) and [Juan Luis Santiago^{3,*}](#)

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Abstract

Plant oils have been utilized for a variety of purposes throughout history, with their integration into foods, cosmetics, and pharmaceutical products. They are now being increasingly recognized for their effects on both skin diseases and the restoration of cutaneous homeostasis. This article briefly reviews the available data on biological influences of topical skin applications of some plant oils (olive oil, olive pomace oil, sunflower seed oil, coconut oil, safflower seed oil, argan oil, soybean oil, peanut oil, sesame oil, avocado oil, borage oil, jojoba oil, oat oil, pomegranate seed oil, almond oil, bitter apricot oil, rose hip oil, German chamomile oil, and shea butter). Thus, it focuses on the therapeutic benefits of these plant oils according to their anti-inflammatory and antioxidant effects on the skin, promotion of wound healing and repair of skin barrier.

Dermal targeting using colloidal carrier systems with linoleic acid

[Alexandra S.B.GoebelaUlrichKniebChristophAbelsbJohannesWohlrabcReinhard H.H.Neuberta](#)

Cite

<https://doi.org/10.1016/j.ejpb.2010.02.001>[Get rights and content](#)

Abstract

In the basic therapy of chronic skin diseases characterized by xerosis, the local treatment is an essential strategy to reach ideal therapeutic effects. Suitable active ingredients for this aim are fatty acids, in particular linoleic acid, which is an essential component for the organization and perpetuation of the skin barrier. In the present work, the development of a well-tolerated colloidal carrier system (microemulsion) containing linoleic acid as active ingredient is described. A comprehensive physicochemical characterization of the novel microemulsion system was performed using different techniques. The potential of the developed microemulsion system compared to a cream as suitable carrier for the dermal delivery of linoleic acid was determined. Penetration studies showed higher linoleic acids concentrations after administration of the colloidal carrier system in all skin layers independent of the time of incubation. Up to 23% of applied dose reached the skin from the colloidal carrier system whereas at most 8% of the active ingredient could be detected after applying the cream. Particularly, the percentage of the linoleic acids penetrated through the microemulsion in the stratum corneum and the viable epidermis differed significantly ($p < 0.01$) when compared to that through a standard cream. Furthermore, linoleic acids accumulated in the epidermis at longer incubation times. Using the microemulsion, the penetration of linoleic acids was enhanced significantly ($p < 0.01$). Hence, the

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microemulsion might be an innovative vehicle for the delivery of linoleic acids to the epidermis improving its use as their barrier regeneration and providing possible anti-inflammatory effects.

A Topical Anti-inflammatory Healing Regimen Utilizing Conjugated Linolenic Acid for Use Post-ablative Laser Resurfacing of the Face: A Randomized, Controlled Trial

[Douglas C. Wu](#), PhD, MD and [Mitchel P. Goldman](#), MD

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Abstract

Background: Fractionated, ablative lasers are usually associated with post-treatment erythema, edema, and crusting, which can last from 5 to 14 days. Conjugated linolenic acid, an omega-5 fatty acid, has significant antioxidant and anti-inflammatory properties, and has been shown to stimulate keratinocyte proliferation and epidermal regeneration. By modulating the early inflammatory milieu and directly affecting skin structure and function, conjugated linolenic acid might therefore shorten downtime following fractionated ablative laser resurfacing of the face.

Objective: To evaluate the efficacy and subject satisfaction of a topical regimen containing conjugated linolenic acid derived from pomegranate seed extract in accelerating wound healing and improving skin quality following fractionated ablative laser resurfacing of the face.

Materials and Methods: Thirty-four subjects were enrolled and received fractionated CO2 laser resurfacing. Subjects were randomized to use the test healing regimen (n=24) or 1% dimethicone ointment (n=10) post-procedure. The primary endpoint was the degree of erythema, edema, crusting, and exudation evaluated by a blinded clinician at post-treatment Days 1,3,7,10, 14, and 30. Secondary endpoints included a blinded evaluator assessment of the degree of wrinkling and elastosis using the Fitzpatrick-Goldman Wrinkle and Elastosis Scale; subject-assessed degree of pain, itching, tightness, oozing, and crusting; and subject overall satisfaction.

Results: Subjects who applied the topical conjugated linolenic acid healing regimen experienced significantly reduced edema on post-procedure Day 3 (p=0.04), and itching on Days 1 and 3 (p=0.03 and p=0.04). Both regimens produced significant improvements in wrinkling and elastosis at Days 14 and 30 post-treatment, with conjugated linolenic acid outperforming placebo in improvements in wrinkling at Day 14. Both regimens were well tolerated with no statistical differences in adverse events or subject satisfaction. Conclusion: The topical conjugated linolenic acid formulation outperformed placebo by decreasing acute pruritus and edema, and enabling a faster positive outcome in wrinkle improvement. Additionally, topical conjugated linolenic acid does not raise any safety or tolerability issues as compared to current standard of care.

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VERIFIED BY THE ENVIRONMENTAL WORKING GROUP

Verified by the Environmental Working Group (EWG), this serum has passed the personal care industry's highest standard for clean ingredients. EWG only verifies products that are free of chemicals of concern and transparently produced—it's no surprise that DermaBiotics™ Plant-Based Regenerating Serum passed with flying colors!