



Effect of Omega3 for the Skin Diseases- A Review

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ABSTRACT

Background: Omega3 is a group of fatty acids which is essential and of great importance to the human body, they cannot be produced on their own, so it must be obtained by following diets that include foods rich in them. Omega 3 is nowadays one of the most desirable components of oils because of its nutritional and functional properties. Through its various processes in cellular metabolism, its therapeutic actions in numerous chronic inflammatory and autoimmune disorders have been identified, gene expression, and signal transduction. Numerous studies have confirmed that acne, psoriasis, and inflammatory skin conditions including atopic dermatitis can all be managed with omega 3.

Objective: The review's objective is to provide a brief scientific overview of this condition, which has recently become widespread used in the treatment of skin diseases.

Conclusion: The effects of "3 PUFA" in skin illnesses are only seldom studied in research and clinical trials, but prior studies analyzing immune cells predict that these fatty acids will have a wide range of positive benefits. Additionally, there are few findings on keratinocytes, which are thought to make up a significant portion of the epidermis' cells. Future studies should clarify the complete role keratinocytes play in the skin. since the prevalence of inflammatory skin conditions and cancers is rising at the moment, clinical trials in the future on "3 PUFAs" in dermatological sectors are likely to provide us with useful knowledge for the routine clinical management of skin problems.

Keywords: Polyunsaturated fatty acids, "PUFAs," omega-3, psoriasis, skin.



INTRODUCTION

The numerous physiological, pathological, and histological functions of the human body are affected by a number of environmental elements that are essential for humans to thrive on earth[1], [2]. The consumption of food is crucial for the development of an animal's body and for the reconstruction of its structure from its constituent components.[3] Fatty acids, one of the essential nutrients obtained from food, are a part of cells that are known to regulate a variety of functions of cells.[4],[5]

Omega-3 polyunsaturated fatty acids (O3-PUFAs) are consist of eighteen carbon atoms, possibly more, in a duple bonds with 3 atoms missing from the terminal methyl group, additionally, they are typically categorized into three distinct lipids: - "linoleic acid ("ALA"), -hexaenoic acid ("DHA"), and -eicosapentaenoic acid ("EPA)". Enzymatically, -linoleic acid is transformed first into toeicosapentaenoic acids, then into docosa-hexaenoic acids [6]. Due to the high concentration of enzymes in the human body, these alterations predominantly happen in the liver which are very restricted. [7],[8]. Because of this, it makes sense to get "DHA" and "EPA" from nutriments and nutritional increments that also include fish oils.

In many inflammatory disorders, like psoriasis, inflammatory bowel diseases, asthma, and rheumatoid arthritis, (O3-PUFAs) have been shown to have anti-inflammatory properties. [9],[10] Resolvins "Rvs" and maresins, two omega-3 "PUFA" metabolites, possed strong anti-inflammatory properties in current research. By 15-lipoxygenase, protectins "PD" and D-series "Rvs" are transformed from "DHA."; E-series "Rvs" are created from "EPA" by acetylated cyclo-oxygenase-2 or the cytochrome P450 processes. In the many inflammatory illnesses, like asthma in models of animals [11] and colitis[12], these metabolites necessitate potent anti-inflammatory activities, little is understood about their role in skin infections, despite the fact that they also have antitumor properties in malignancies. Our review concentrated on the anticancer effects against cutaneous cancers as well as the healing impending of (O3-PUFAs) metabolites for inflammatory infections of skin. The physiology of skin is reinforced by unique fat digestion.

The main organ of the body was skin which serves as a barrier to prevent loss of water and the admission of dangerous substances from the outside, in addition to offering some protection from solar radiation[13]. Furthermore, it promotes thermoregulation, facilitates inflammatory and immunological responses, and permits perceptions of pain, temperature, and touch. The variety of bioactive lipid intermediaries was from the skin, which is classified in active lipid metabolism and has a specific outline of lipids[14]. The skin has 3 main sheets: dermis, epidermis, and hypodermis which is a consequence of its gives continuously active defensive purpose. As they move upward, epidermal keratinocytes differentiate, eventually developing into corneocytes. To create the stratum corneum, these protein-enhanced corneocytes are implanted in a fat-rich background that contains numerous ceramide types, cholesterol, and free fatty acids[15], [16]. The dermis, which is made up of a variety of vital components, including nerves, tiny blood vessels, hair follicles, and sweat glands, is surrounded by collagen and elastic fibers and dermal fibroblasts.



[14], [17]. Adipose tissue serves primarily as a repository for lipids, but it is also a source of fat intermediaries with signaling qualities derived from fatty acids [18]. On the skin's surface, lipids derived from sebum are present in a complex mixture of triacylglycerols, di-acylglycerols, non-esterified fatty acids, wax esters, squalene, and cholesterol esters that provide photoprotection and have antimicrobial properties. [19], [20].

In essence, epidermal keratinocytes have been shown to contain too little desaturase action, which results in limited aptitude to synthesize extended sequence PUFA, with the exception of arachidonic acid (AA; 20:4n-6) [21]. This emphasizes how crucial systemic long chain, and function of the epidermis and the supplementation of PUFA for skin health. Linoleic acid (LA) is an important fatty acid that is particularly important for maintaining healthy skin since it helps to generate ceramides that are required for the epidermal barrier's structure. [15], and the problems with barrier permeability are caused by the lack of ceramides in the stratum corneum that contain LA [22]- [24]-[25].

Skin and polyunsaturated fatty acids {PUFAs}

Because "5- and 6-FADS" enzymes are not present in the skin, "LC-PUFAs" derivative synthesis is minimal. These enzymes show an important role in the development of the cascade that leads to the manufacture of inflammatory modulators, eicosanoids, and arachidonic acids. They are also susceptible to external influences, including trans-fats, hypothyroidism, aging, vitamin B6 and zinc insufficiency, and deficiency, as these conditions decrease the action of the desaturase enzymes, these influences include fat-free and diets high in glucose. Due to these circumstances, "ALA and LA" convert at a low rate." [26] The "LA" is the most noticeable "FA" in the epidermis. It serves as the building block for ceramides, an essential element of the matrix that creates the stratum corneum absorbency wall, and this wall is made up of 3 main parts: cornified envelop, the extracellular lipid medium, and the dense keratin fibrils that filaggrin protein has gathered [27]. Lipids, enzymes, and anti-microbial peptides are located between lamellar structures in the stratum spinosum and granulosum of the higher coatings of the epidermis [27]. An external lipid matrix covering cornified envelop proteins creates the sturdy watertight lamella. Failures in the production of "SCBP" are caused by mutations in the genes that code for proteins and enzymes when they are in a state of lipid deprivation. [28]. Because of the lack of $\Delta 6$ - and $\Delta 5$ -elongase, the epidermis may synthesis mono-unsaturated and saturated FAs, as opposed to "PUFAs", that must be obtained through diet. [29]. The research suggests that they are more selective for PUFA than for monounsaturated fatty acids sources of PUFAs.[30]

The normal western diet, which is high in processed foods and low in fish meals, has a high dietary intake of omega-6 compared to red meat. [31], and considered as an important sources of "-6 PUFAs" in the form of "LA" with low quantities of "-3 FAs," with "ALA" being the first to be mentioned. Contrary to "-6 FAs," "-3" intake is typically insufficient due to constrained sources. [32] The normal Western diet has a $\{\omega-6/\omega-3$ ratio is 15/1 to 16.7/1}, however official Japanese agencies advocate a ratio that ranges from 1:1 to 4:1. (Table 1). Triacylglycerols ("TAG"), phospholipids ("PL"), di-acylglycerols ("DAG"), and cholesterol esters

("CE") make up the majority of "PUFAs" in foods derived from plants and animals. Due to their aliphatic properties, "PLs" are the most bioavailable, which improves water dispersibility and increases susceptibility[33]. As a result, krill oils made from Antarctic krill (*Euphausiasuperba*), which are rich in "PL" form -3 PUFAs, are growing in popularity as " ω -3" supplement, increased vulnerability.[34].

PUFA Metabolites' Anti-Inflammatory Effect on Skin Diseases

Numerous studies have shown that omega-3 "PUFA" metabolites have anti-inflammatory effects on skin inflammatory conditions such as atopic dermatitis and ultraviolet "UV" radiation. Additionally, it has been observed that "PUFA" metabolites have antitumor effects on squamous cell carcinoma and melanoma. (Table1).

Table(1) a description of how inflammation-causing effects of O3PUFA metabolites affect inflammatory skin diseases:	
Inflammatory Skin Disease	O3-PUFA Metabolites
Psoriasis	{ Maresin-1 } { ResolvinE1 } { ResolvinE1 }
Atopic- Dermatitis	{ ResolvinE1 }
Contact-Dermatitis	{ ResolvinE1 }
UV-Radiation	{ Maresin-1 }
Wound-healing	{ Protein D1 } { Resolvin D1 }
Malignancy-Squamous cell carcinoma	{ Resolvin D2 }
Malignant-melanoma	{ Resolvin D1 } { Resolvin D2 }

Psoriasis and {PUFA} Metabolites

An example of an inflammatory skin condition involving epidermal proliferation and scaly erythematous plaques is psoriasis[38]. Although the exact cause of psoriasis is still unknown, new research has identified certain common pathways that underlie pathogenic diseases and the role of the TNF/IL-23/IL-17 axis[39]-[40].

Actually, "MaR1" prevents IL-23 subcutaneous instillation-persuaded inflammation of skin and imiquimod-induced skin inflammation that resembles psoriasis[35].



"RvE1" hinders psoriatic dermatitis brought on by imiquimod [36]. Additionally, after "RvE1" treatment, neutrophils and cells that create IL-17 are decreased in the skin. According to reports, "RvE1" inhibits the regulation of IL-23 and IL-17. "IL-23" creation by "DCs", in addition to the immigration of DCs and IL-17 creating cell, is inhibited by RvE1. "RvD1" decreases acanthosis and the hyperkeratosis induced by imiquimod [37].

Clinical Evaluation of O3-PUFA for Cutaneous Skin Diseases

The researchers were examined many clinical trials and concluded their investigation. There are various tests for psoriasis and atopic dermatitis.

The Scoring in Atopic Dermatitis increases as omega-3 supplementation increases [41]. Patients with AD who everyday received omega-3 fatty acid supplementation showed signs of high serum EPA concentration and a less severe form of the disease, according to a randomized, double-blind, placebo-controlled experiment. [41]-[42].

Obese individuals who have psoriasis were given conventionally energy-restricted diets enriched in 3-PUFAs, and these individuals displayed weakened Dermatological Life Quality Index and Psoriasis Area Score Index (PASI) scores[43]. A randomized study conducted in multiple centers found that participants who consumed 200 ml of omega-3 fatty acid intravenously daily 4.2 g of each EPA and DHA—had a lower overall "PASI" score without experiencing any negative significant side effects [44].

Squamous cell carcinoma of head and neck has been described, despite the absence of clinical studies on cutaneous malignancies. In such patients, daily supplementation with 2 g of EPA causes loss of weight, affects the creation of serum pro-inflammatory cytokines, and improves patients' quality of life [45].

Conclusion

As stated by earlier researches evaluating immune cells, numerous favorable benefits are anticipated in skin disorders despite the fact that there is a dearth of studies the effects of 3-PUFA in skin diseases. Keratinocytes, which are thought to make up a significant portion of the cells found in the epidermis, are also the subject of a dearth of reports. Future studies should clarify the complete role keratinocytes play in the skin. Future fundamental studies of 3-PUFAs in dermatology sectors are likely to provide researchers with useful evidence for the routine medical treatments for skin illnesses given the prevalence of inflammatory skin diseases and malignancies, both of which are at present on the rise.

Conflict of interests

There are non-conflicts of interest.

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الخلاصة

المقدمة: أوميغا 3 هي مجموعة من الأحماض الدهنية الأساسية ، والتي لها أهمية كبيرة لجسم الإنسان ، والتي لا تستطيع إنتاجها بمفردها ، لذلك يجب الحصول عليها باتباع الحميات الغذائية التي تحتوي على الأطعمة الغنية بها. أكثر مكونات الزيوت المرغوبة لما لها من خصائص غذائية ووظيفية. تم تحديد آثاره العلاجية في العديد من الأمراض الالتهابية المزمنة وأمراض المناعة الذاتية من خلال آلياته المختلفة في التمثيل الغذائي الخلوي والتعبير الجيني ونقل الإشارات ، وقد أكدت العديد من الدراسات أن أوميغا 3 مفيد في علاج أمراض الجلد الالتهابية والتهاب الجلد والصدفية. وحب الشباب.

الهدف: تهدف المراجعة إلى تقديم لمحة علمية موجزة عن هذه الحالة، التي أصبحت مؤخرًا مستخدمة على نطاق واسع في علاج الأمراض الجلدية.

النتائج: إن الأبحاث والتجارب السريرية محدودة لدراسات آثار {ω3 PUFA} في الأمراض الجلدية ، وفقًا للدراسات السابقة التي تقيم الخلايا المناعية ، من المتوقع حدوث العديد من الآثار المفيدة في الأمراض الجلدية. بالإضافة إلى ذلك ، توجد تقارير محدودة متاحة عن الخلايا الكيراتينية ، والتي تعتبر مكونًا رئيسيًا للخلايا الموجودة في البشرة. يجب توضيح العمل الكامل للخلايا الكيراتينية في الجلد في الأبحاث المستقبلية. نظرًا لتزايد حالات الإصابة بأمراض الجلد الالتهابية والأورام الخبيثة حاليًا ، فمن المحتمل أن تعطينا الأبحاث الأساسية والتجارب السريرية المستقبلية لـ {ω3 PUFAs} في مجالات الأمراض الجلدية معلومات مفيدة عن العلاج السريري اليومي للأمراض الجلدية.

الكلمات المفتاحية: الصدفية ، الجلد ، "PUFAs" ، أوميغا 3 الأحماض الدهنية غير المشبعة