

Selected Evidence-Based Health Benefits of Topically Applied Sunflower Oil

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ABSTRACT

This paper aims to summarize the outcomes of *in vivo* and *in vitro* studies relating to cosmeceutical and phytopharmaceutical potency of sunflower seed oil based on the epidemiological evidence published in the last 13 years. Study design of the reviewed literature included 25 selected scientific articles, as follows: randomized human studies (11), animal studies (6), reviews (5), and *in vitro* studies (3). Topical applied product consisted in raw sunflower seed oil, mixtures with other oils or herbs, and trade cosmetic or medicinal products. Fatty acids from this vegetable oil were shown to alleviate symptoms associated with skin sensitivity and inflammatory skin disorders, as well as to protect skin from photodamage and photoaging. Health benefits of sunflower oil were also found when applying on gingival, respectively on gastric mucosa. In conclusion, topical administration has proven certain positive skin effects but further research may be warranted in order to design more potent and safe phytopharmaceuticals.

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Key words: *cosmeceutical; fatty acids; healthy skin; phytopharmaceutical; sunflower oil.*

Introduction

From skin care to medical therapeutics, sunflower seed oil subjected increasingly research papers in dermatology as well as patent products for two major reasons, respectively (1) an effective, low-cost, and natural alternative, and (2) contains lipids similar in composition to stratum corneum lipids which has been shown to increase the epidermal ceramide and cholesterol synthesis, and to activate peroxisome proliferative-activated receptor alpha (Eichenfield et al., 2009). Literature reviews refer mostly to the use of oils to retain moisture in skin and consequently to preserve and enhance skin barrier (Telofski et al., 2012; Lodén and Maibach, 2012), especially in preterm newborn infants to reduce neonatal mortality and hospital acquired infection (Lawn et al., 2013; Salam et al., 2013). Pediatric dermatologists recommend paraffin and linoleic acid as basic and healthy ingredients for the next generation of emollients, highlighting natural oils such as safflower, grape seed, poppy seed and sunflower oil with 70-80% share of linoleic acid. Recently, the emollient effect of certain vegetable oils was assessed by transepidermal water loss measurements and relies on semi-occlusion of the skin surface (Patzelt et al., 2012).

Human evidences on antioxidant property of tocopherols - abundant in sunflower seeds and known as the most common form of vitamin E - are also referring to cosmeceutical photo-protection in dermal applications (Mishra et al., 2011), especially in the form of natural unesterified tocopherols as demonstrated by *in vitro* human skin cell (keratinocytes) test using simulated solar UV radiation (Alander et al., 2006). There is evidence that photo-protection by n-3 polyunsaturated fatty acids relies on a balance between inflammatory, immune, and antioxidant systems in the skin. Cosmeceuticals are cosmetic products with biologically active ingredients purporting to have medical or drug-like benefits when applied topically, such as creams, lotions and ointments (dictionary), but not expected to be similar to a pharmaceutical product. In this respect, emollient and antioxidant properties of topical applied sunflower oil should be regarded from the perspective of repair and maintenance of the epidermal barrier as a skin care product.

By comparison, phytopharmaceuticals are drugs whose active constituents are exclusively plant-based (containing plant parts, extracts, plant juices or distillates) and are used in rational phytotherapy, offering high advantages as they come with safety profiles. For example ozonized sunflower oil meets these requirements, modulating the complex healing process probably by slowly decomposition into different peroxides generating hydrogen peroxide that can explain the prolonged disinfectant and stimulatory activity (Travagli et al., 2010). Sunflower oleodistillate containing 90% essential lipids, 5%

phytosterol, and 1% vitamin E has proven *in vitro* and *in vivo* a triple action on cutaneous barrier homeostasis, inflammation, and immunologic response specific to atopic dermatitis (De Belilovsky et al., 2011). In modern medicine, translation of traditional remedies into phytomedicines is based on the role of phytochemicals which show a positive correlation between their modern therapeutic use and the traditional use of the plants from which they are derived. In this respect, new antioxidant formulations to improve stability of vegetable oils are welcome (Oancea and Grosu, 2014; Stoia and Oancea, 2013). The aim of this paper is to highlight the health benefits of topical applied sunflower oil based on high quality evidence.

Method

Articles addressing the topical application of raw sunflower seed oil or products containing the oil concerned were identified through on line search in scientific databases, following publications between 2002 and 2014. The evidence-based review system was performed in order to meet the eligible criteria of health claims primarily in human studies and secondary in animal and *in vitro* studies, according to the levels of evidence hierarchic differentiated in table 1.

Table 1. Levels of evidence (Source: Natural Medicines Comprehensive Database).

Level	Definition
A	High-quality randomized controlled trial (RCT)
A	High-quality meta-analysis (quantitative systematic review)
B	Nonrandomized clinical trial
B	Nonquantitative systematic review
B	Lower quality RCT
B	Clinical cohort study
B	Case-control study
B	Historical control
B	Epidemiologic study
C	Consensus
C	Expert opinion
D	Anecdotal evidence
D	<i>In vitro</i> or animal study
D	Theoretical based on pharmacology

Results And Discussion

25 from 31 of the reviewed scientific articles were selected and classified as follows: 11 human clinical trials, 6 animal studies, 5 reviews, and 3 *in vitro* studies. The prevalence of human trials (44%) in the selected epidemiological evidence, as shown in figure 1, points out the practical interest of scientists for new topical therapies inspired by nature, and less harmful. The applied product consisted in sunflower seed oil, experimental mixtures (Skin conditioner; Essential fatty acid solution; Eicosa-pentaenoic acid), and commercial products (Oleozon; Psirelax). Evidence-based results and studies conclusion are summarized in table 2.

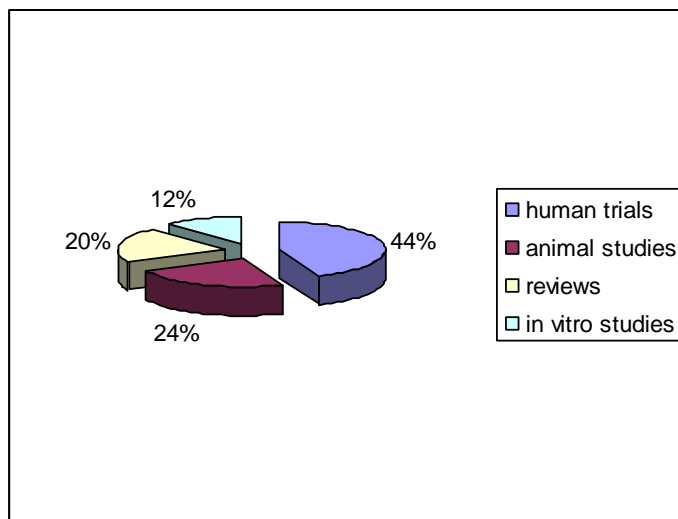


Figure 1. Study design of the reviewed literature

Table 2. Evidence-based health benefits of topically applied sunflower oil.

Level	Product	Conclusions	Ref.
Randomized clinical trial	Sunflower seed oil	Enhances skin barrier function, and prevents invasive bacterial infections;	(Kanti et al., 2014; Danby et al., 2013; LeFevre et al., 2010; Nawshad et al., 2007; Darmstadt et al., 2005; Darmstadt et al., 2004)
	Oleozone®	Demonstrated effectiveness in the treatment of onychomycosis, superior to that of ketoconazole;	(Menéndez et al., 2011)
	Skin conditioner (mixture)	Complementary treatment in mild to moderate severe psoriasis;	(Maier et al., 2004)
	Sunflower oil	Diminishes the „scaly skin” symptoms of patients known to be deficient in essential fatty acids (topical supplementation);	(Aburjai and Natsheh, 2003)
	Vitamin E and F containing toothpaste	Reducing plaque levels and improving gingival conditions;	(Schäfer et al., 2007)
Open label study	Linoleic acid	A constituent of sunflower oil can become incorporated into human gingival tissue after application in vivo and, in so doing, “nourish” human gingiva.	(D’Agostino et al., 2007)
	Psirelax® (mixture)	Decrease in psoriasis severity	(Shiri et al., 2011)
	Cosmeceutical	Anti-wrinkling and anti-ageing properties;	(Mishra et al., 2011)
	Sunflower oleodistillate (SOD)	Moisturizing properties in adults, and strong steroid-sparing effect in infants and babies with atopic dermatitis;	(Eichenfield et al., 2009)
	Sunflower oil	As a minor ingredient in skin protectant drug products in neonates;	(Visscher, 2009)
Systematic review	Sunflower oil	Dry skin treatment for smoothing and noncomedogenic properties;	(Singh et al., 2014)
	Essential fatty acids (EFA)	The analyzed studies, mainly performed using animal models, are not appropriate to indicate EFA as an efficient therapy for wound healing in humans.	(Ferreira et al., 2012)
Critical review	Sunflower seed oil	Accelerates the healing process in wounded horses, goats, lambs, and mice;	(Oliveira et al., 2012; Abhishek et al., 2012; Marques et al., 2004; Darmstadt et al., 2002)
	Sunflower seed oil	40 % protection in the mouse skin tumor (papiloma) model;	(Kapadia et al., 2002)
	Ozonized sunflower oil	94 % average mycological cure in experimental dermatophytosis in mice.	(Thomson et al., 2011)
Animal study	Sunflower seed oil	Effectiveness by antimicrobial activity index on <i>S. aureus</i> , <i>E. coli</i> , <i>B. subtilis</i> , <i>P. aeruginosa</i> , <i>Candida albicans</i> ;	(Aboki et al., 2012)
	Ozonized sunflower oil	A direct chemical-oxidation attack on <i>Giardia duodenalis</i> cultivated trophozoites;	(Hernández et al., 2009)
	Eicosa-pentaenoic acid (EPA)	EPA is a potential agent for the prevention and treatment of skin aging in human dermal fibroblasts.	(Kim et al., 2005)

Regardless of the applied product (per sé, mixtures with other oils or herbs, and trade cosmetic / medicinal products), sunflower oil has proven certain qualities involved in the health of the skin *via* enhancing skin barrier function and local lipid production, reducing inflammation, activating peroxisome proliferative-activated receptor-alpha, promotion of wound healing, and promotion of apoptosis in malignant cells (McCusker and Grant-Kels, 2010). Ozonized sunflower oil (Oleozone) and sunflower oleodistillate (SOD) were among the most used products in clinical trials compared to crude oil which was mainly used in animals for wound healing or to improve outcome in neonates with compromised barrier function as a low-cost efficient alternative. Moreover, n-6 and n-3 EFAs seem to be crucial to skin function and appearance, respectively n-6 fatty acids are related to skin sensitivity and inflammatory skin disorders, while n-3 fatty acids are protectors in photo-damage and photo-aging. Therefore, topical supplementation may be a route of delivery during EFA deficiency.

In conclusion, there is strong evidence coming from human studies and systematic reviews which supports the following health benefits of topical applied sunflower oil: antifungal treatment in adults' onychomycosis, infection preventing in premature neonates, atopic dermatitis treatment in infants and babies, “dry skin” and “scaly skin” treatment in adults and elders with EFA deficiencies, anti-wrinkling and anti-ageing properties, improving gingival condition, and psoriasis complementary treatment. A promising adjuvant therapy in skin cancer comes from animal papiloma model, but further clinical trials are expected to support this hypothesis as well as other health claims on phytopharmaceutical potency of sunflower oil.

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