



Review Article

A Review on Homemade Sunscreen

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Background

The making of homemade versions of sunscreens is becoming a popular movement across social media platforms, as proponents claim these alternatives are safer and effective. There is a scarcity of information on the make-up of common homemade recipes and the ways in which they compare to FDA-approved sunscreens.

Objective

This review discusses the main components and implications of social media-derived homemade sunscreen alternatives.

Methods

We conducted a review of the common ingredients used in homemade sunscreen recipes.

Results

Common homemade sunscreen recipes are composed of a base of sun protective filter, a water protective agent, an emollient oil, and an essential oil. The self-made versions are thought to be effective alternatives without the addition of harmful ingredients. Though many of these recipes contain more natural ingredients, they do not undergo the same scientific testing protocols to offer information on sun protective factor and safety.

Discussion

Understanding the limitations of homemade skincare alternatives may help clinicians counsel their patients on the potential risks associated with its use and reveal potential health concerns related to the spread of misinformation across popular media platforms.

Capsule Summary

This article offers additional insight into the formulary properties of homemade sunscreen recipes and the differentiating features from standard sunscreens. The presented information prompts experts in the field to further investigate the efficacy of homemade sunscreen alternatives and to consider the impact of scientifically unproven trends in dermatology.

INTRODUCTION

Homemade sunscreens have gained popularity over the past few years as a result of social media influences. Social media platforms often feature influencers and bloggers promoting their own homemade recipes as safer and healthier alternatives to commercial products, fueling the spread of these ideas.^{1,2} The benefits of homemade sunscreens include avoiding hormone-altering chemicals, safer impacts on the environment, and the addition of natural oils that function as sun protection.¹ Our objective is to review the current literature on homemade sunscreens and assess the potential efficacy and risks associated with their use. With the growth in media-influenced trends, we aimed to ex-

amine the popularity of homemade sunscreens by investigating the formulation of these products, their ingredient properties, and their differentiating features from FDA-approved sunscreens.

METHODS

We performed a review of the PubMed and Google Scholar databases from the years 2001-2024 using terms from the Medical Subject Headings (MeSH) “sunscreen” and “homemade.” We also manually reviewed references of those articles we selectively retrieved for our study to broaden our search of applicable articles that may have been missed during the initial PubMed search. Due to limited research

on this topic, we also searched popular social media sites, popular search engines, and web forums that discussed the production of homemade sunscreens.

RESULTS

Based on information presented in various internet blogs and social media sites, individuals who decide to make their own sunscreen at home in order to avoid the chemicals found in sunscreens sold at stores usually use one of two methods. According to various blog posts by *Modern Hippie Inc.*, *Wellness Mama*, and *Into The Gloss*, one method described is to use all raw ingredients to create the sunscreen from scratch, while another method is to use an existing lotion and turn it into sunscreen by adding sun protective ingredients.

In the most basic form, sunscreen requires a sun protective agent which comes in organic (including chemical filters like benzophenones) and inorganic forms (including mineral filters like zinc oxide and titanium dioxide), an agent to make the sunscreen water-resistant (typically beeswax), oils, and butters for an emollient base (including olive oil, coconut oil, almond oil, shea butter), and essential oils for fragrance.³ Due to the environmental impact of using chemical filters, most individuals interested in making sunscreen at home opt for mineral filters, specifically zinc oxide as the sun protective agent in their formulation.

INORGANIC SUN FILTERS

Inorganic sun filters including zinc oxide and titanium dioxide are mineral active ingredients which are a key component of inorganic sunscreens since the 1980s.⁴ The size of these minerals can be in the range of non-nano or nanoparticles. Nanoparticles of zinc oxide are in the range of 200-400 nm and 150-300 nm for titanium dioxide.⁴ These particles provide sun protection due to their ability to absorb UV radiation with a small degree of scattering of light from reflection.⁴ Non-nano particles of zinc oxide are typically used in the formulation of homemade sunscreen. This leads to a higher SPF value, but decreases the amount of transparency of the sunscreen, leaving a white (from zinc oxide) or blue/white (if titanium dioxide) appearance.⁴ The FDA has approved up to 25% zinc oxide as the active ingredient in sunscreens.⁵

Internet users have several formulas they use in order to estimate the percentage of zinc oxide correlating to a value of SPF; however, no studies have been published to back up these values. In addition, the zinc oxide purchased by internet users is not specially coated, which causes the zinc oxide particles to clump together and does not provide evenly distributed protection when applied on the skin. These coated particles used in commercial sunscreens are advantageous in the formulation because they are non-greasy, inexpensive, and can provide an even distribution on the skin that does not degrade with exposure to UV radiation.⁴

In addition, inorganic UV filters including zinc oxide and titanium dioxide have few to no side effects in humans.⁴

There have been in vitro and in vivo experiments conducted with titanium dioxide resulting in increased mitochondrial dysfunction, oxidative stress, and hippocampal cell apoptosis if the inorganic filters are able to penetrate the stratum corneum to enter the dermis and eventually the blood supply.⁴ However, these inorganic filters do not typically penetrate through the skin to any significant degree.⁴

BEESWAX

According to many homemade sunscreen forums, the use of beeswax is important in sunscreen to give the formulation a solid texture when mixed with various oils as well as giving the sunscreen water resistance through its occlusive properties.^{6,7} Composed of hydrophobic substances including hydrocarbons, fatty acids, and esters, beeswax acts as an effective occlusive agent by forming a film on the skin's surface and protecting against external irritants while buffering excess transepidermal water loss on the skin.^{6,8} There are two types of beeswax usually used in cosmetic products, including yellow (*Cera flava*) and white (*Cera alba*).^{6,8} In terms of safety, beeswax is generally thought to be nonirritating and has low comedogenic potential with some previously noted antimicrobial, anti-inflammatory, and antioxidant properties.⁶

OIL

Oils are used as the base of many homemade sunscreen recipes on the internet as they are easily absorbed by the skin and make lotions and creams very spreadable.⁹ The most commonly used oils in homemade sunscreen include olive oil, coconut oil, and almond oil. Previous research has found photoprotective properties in certain oils due to functional groups they possess that can absorb UV radiation.^{10,11} A study on the SPF values of olive oil, coconut oil, and almond oil in vitro were 8, 7, and 5, respectively.¹² Other oils believed to confer higher SPF include carrot seed, coconut, raspberry seed, rosehip seed, and wheat germ oil. However, recent studies revealed that these same oils, including many vegetable oils, are not able to adequately absorb UVB light and lack photoprotective properties.^{11,13,14} Though the utility of oils in sunscreen to provide SPF is low, their properties as emollients still make it a useful ingredient for homemade sunscreens.

ESSENTIAL OILS

Essential oils are added to homemade sunscreen for fragrance. However, certain essential oils contain a photoactive component known as furocoumarins, which can produce a phototoxic reaction when exposed to the sun.¹⁵ The most potent and well-known of these phototoxic substances is bergapten and its derivatives, including bergamottin, citropten, herniarin, and oxypeucedanin, which are found in oils derived from the herb species *Seseli libanotis*.^{15,16} Furocoumarins are found in large quantities of various oils including lime oils, lemon oils, grapefruit oils, bergamot oils, and bitter orange oils, while other oils, such as angelica root, cumin, rue, Virginian cedarwood, and

Table 1. The main components used in homemade sunscreens with the purpose of each component and common examples.

Main Components of Homemade Sunscreen	Purpose	Common Examples
Sun Protective Agent	Inorganic (mineral) filters help to absorb UV radiation	Zinc oxide, Titanium oxide
Water Resistant Agent	Prevents water loss from the skin and protects against external irritants	Beeswax (Cera flava - yellow, Cera alba - white)
Emollient Base (Oil)	Oils provide a smooth base for the sunscreen that is easily spreadable onto the skin	Olive oil, Coconut oil, Almond oil, Jojoba oil, Carrot Seed oil, Rosehip Seed oil, Avocado oil, Argan oil, Sunflower seed oil
Essential Oil (Optional)	Added for fragrance or color but may pose phototoxic risks due to furocoumarins	Lavender oil, Peppermint oil, Tea tree oil, Eucalyptus oil, Geranium oil

lemon verbena contain smaller quantities of these photoactive components.¹⁶⁻²⁰ Furocoumarins' properties are responsible for the potential risk of a photosensitization reaction that may result after exposure to ultraviolet light.²¹ Though essential oils may be a component in some recipes of homemade sunscreens, a variation of ingredients may be used, and other formulations may be prepared with ingredients other than those mentioned throughout this text.

INGREDIENTS TO AVOID

Sunscreens or lotions used to make homemade sunscreen should not contain vitamin A, as vitamin A increases the skin's sensitivity to the sun.²² According to the American Academy of Dermatology, there is also a list of ingredients that still require more research before they are generally regarded as safe and effective (GRASE). Of these, ensulizole, octisalate, homosalate, octocrylene, octinoxate, oxybenzone, and avobenzone are commonly used in the U.S. while the ingredients cinoxate, dioxybenzone, meradimate, padimate O, and sulisobenzene are not commonly used in the U.S.²³

PROPOSED SPF CONVERSIONS

As presented on many of these internet blogs, some individuals who make sunscreen at home share different amounts of powder zinc oxide equating to specific SPF values that have not been reported through any formal testing or research. A blog by the name of *Modern Hippie Inc.* claims that about 0.27 ounces of zinc oxide equates to an SPF of 2-5 and 0.68 ounces to an SPF of 6-11, while another recipe by *Don't Waste the Crumbs* reports a conversion of one ounce of zinc oxide to an SPF of 20. Despite an effort to provide readers with a reliable conversion tool, the lack of scientific support or testing results in misleading information that is neither accurate nor reliable when determining the efficacy and safety of a homemade product.

THE MOST COMMON INGREDIENTS IN HOMEMADE SUNSCREEN RECIPES

A review of homemade sunscreen ingredients from the top 50 Google search results, which included a combination of

blog posts and social media videos, highlights distinct patterns in ingredient selection (Table 2). Out of 50 homemade sunscreen recipes, coconut oil (98%), shea/cocoa butter (92%), and beeswax (74%) were the most common included ingredients, likely serving as the primary base components in homemade sunscreen formulations. Despite limited scientific validation, certain oils were specifically included for their perceived SPF benefits. Carrot seed oil (50%) and red raspberry seed oil (28%) were among the most frequently recommended for their high SPF claims, with reported mean SPF values reaching 37.4 and 39.9, respectively. Non-nano zinc oxide powder (100%) was included in all homemade sunscreen recipes for its sun-protective properties with varying concentrations across recipes. The mean SPF claim was 18.3 with a range of 2-50 SPF, depending on the amount of zinc oxide powder used. Non-nano titanium dioxide (12%) was mentioned less often, but 6 homemade recipes included titanium dioxide with zinc oxide powder. Essential oils (46%) were included in many recipes as fragrance and cocoa powder (4%) was recommended to be added for darker skin tones.

DISCUSSION

Homemade sunscreens are often unreliable in the protection they offer against UV radiation.^{2,3} The ingredient list in commercial sunscreens displays the UV filter as the active ingredient, which is typically zinc oxide or titanium dioxide. Because this information is widely available, individuals looking to make their own sunscreens may believe these products are easily replicable and equally effective.

The active ingredient in commercial sunscreens usually comprises only about 10-15% of the formulation, mixed with other physical properties and chemicals to make the base. However, these active ingredients interact with the rest of the formulation in complex ways, and simply increasing the amount of the active ingredient does not necessarily increase the SPF. Factors such as the distribution of the active ingredient, its interactions with other ingredients, pH balance, particle size, and the behavior of the sunscreen during application, drying, mixing, and biodegradation on the skin are important considerations in determining its sun protective efficacy.

Table 2. The table summarizes the most frequently mentioned ingredients and each ingredient's SPF claim in homemade sunscreen recipes based on the top 50 Google search results from relevant blogs and social media platform videos.

Ingredients	Number of Mentions in Homemade Recipe, n (%)	Mean SPF claim (range)
Emollient Base (Oil)		
Coconut Oil	49 (98)	5.2 (4-7)
Shea/Cocoa Butter	46 (92)	5.7 (4-6)
Beeswax	37 (74)	1.2 (0-2)
Tallow	4 (8)	1.3 (0-2)
Almond Oil	22 (44)	4.9 (3-6)
Carrot Seed Oil	25 (50)	37.4 (35-40)
Red Raspberry Seed Oil	14 (28)	39.9 (25-50)
Jojoba Oil	9 (18)	4.7 (3-6)
Vitamin E Oil	10 (20)	3.6 (2-5)
Olive Oil	11 (22)	6.1 (2-8)
Avocado Oil	6 (12)	8.7 (3-20)
Aloe Vera	7 (14)	0.8 (0-2)
Sesame Oil	3 (6)	5.4 (2-10)
Rose Hip Oil	2 (4)	3.8 (1-5)
Argan Oil	3 (6)	4.6 (3-5)
Grape Seed Oil	1 (2)	4 (4)
Sesame Oil	3 (6)	5.6 (2-10)
Sunflower Oil	2 (4)	7.5 (5-10)
Walnut Extract Oil	2 (4)	4 (3-5)
Sun Protective Agent		
Non-nano zinc oxide	50 (100)	18.3 (2-50)*
Non-nano titanium dioxide	6 (12)	17.8 (2-30)*
Fragrance (optional)		
Vanilla Extract	3 (6)	
Essential Oils	23 (46)	
Darker skin tone (optional)		
Cocoa Powder	2 (4)	

*SPF claim dependent on amount (in grams) in the homemade recipe

Unlike commercial sunscreens, homemade products do not undergo the same rigorous human safety testing, formulation design, and SPF verifications to ensure they meet quality standards and that they provide broad-spectrum protection against both UVA and UVB rays.⁹ These important regulatory parameters help prevent inconsistent and potentially dangerous short- and long-term consequences of poorly tested products. Homemade sunscreens lack the necessary testing to verify if they provide adequate sun protection, leaving individuals uncertain about the actual SPF they are achieving. Additionally, there is widespread misinformation regarding SPF ratings for various oils, which often do not provide the protection claimed. Similarly, incorrect information is being circulated online about the percentage of zinc oxide used in sunscreen formulations and its corresponding SPF. Various conversion charts are displayed alongside recipes posted on the internet, though none that were found had undergone any formal testing or

research to confirm the accuracy of the conversions. Additionally, non-nano titanium dioxide is not available to the average consumer, but 6 homemade recipes still included this sun protective agent in combination with zinc oxide, further emphasizing the misinformation regarding ingredient accessibility. Carrot seed oil and red raspberry seed oil were associated with high but scientifically unverified SPF range claims (35-40 and 25-50), respectively. These claims have not been supported by clinical studies, yet their frequent recommendation in sunscreen formulations suggests a potential overestimation of natural oil-based sun protection and these individuals may believe combining multiple oils with purported SPF properties will enhance sun protective effectiveness.

Homemade sunscreens may be unfavorable replacements for standard sunscreens due to insufficient evidence of the efficacy of their protective properties and the lack of data supporting the stability of their ingredients. The sun

protection factor of homemade sunscreens cannot be systematically tested or measured. Additionally, the efficacy and safety of a product require an understanding of its stability in regard to its formulation.²⁴ There are several attributes of a formula that contribute to its stability, wearability, and potency, warranting a need to thoroughly understand how a sunscreen product offers protection and utility. Given the complexity of developing an effective sunscreen, it may be necessary to take caution when relying on such products that do not undergo evidence-based testing for human use.

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ABBREVIATIONS USED

SPF, UVA/UVB, FDA

CONFLICTS OF INTEREST

None

FUNDING

None

PATIENT CONSENT

Not applicable

IRB APPROVAL

Not required

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