

## ORIGINAL RESEARCH

## Pilot Study on the Effects of Natural Oils on Skin Barrier Function in Xerotic Skin

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## ABSTRACT

**Objective:** To compare the effect of natural oils and white petrolatum on skin barrier function in patients with xerosis.

**Design, Setting, and Participants:** Randomized, open label, comparison pilot study (NCT03093597).

**Interventions:** Participants were randomized to apply 1 of 4 moisturizers to assigned treatment areas twice daily for 2 weeks. Clinical dry skin score, stratum corneum hydration, and transepidermal water loss (TEWL) were assessed at baseline, 1 week, and 2 weeks.

**Results:** Thirty-two participants completed the study. Neither TEWL nor hydration were statistically different among the moisturizers at each visit. All four moisturizers led to significant initial increase in TEWL at week 1 ( $p < 0.05$ ) with an associated increase in hydration for coconut oil, jojoba oil, and white petrolatum. All four moisturizers led to significant increase in hydration by week 2 ( $p < 0.01$ ). The preferred moisturizers were almond oil and coconut oil, which were most “liked” by 38% and 31% of the participants, respectively. The least preferred moisturizer was white petrolatum.

**Conclusions:** Almond oil, jojoba oil, and coconut oil significantly increased hydration after 2 weeks, and are as effective as white petrolatum as daily moisturizers for xerosis. The participants preferred natural oils to white petrolatum, implying that these moisturizer options may improve patient compliance.

## INTRODUCTION

Xerosis is associated with disrupted stratum corneum (SC) integrity and skin barrier function (SBF), leading to decreased hydration and transepidermal water loss (TEWL).<sup>1</sup> There is a growing trend towards

using alternative natural moisturizers, as barrier repair emollients are expensive and often contain potential irritants and allergens. White petrolatum (WP) is a commonly recommended moisturizer, but compliance is often limited by its greasiness.

The fatty acid composition of natural oils contributes to their unique characteristics and effects on the skin; for instance olive oil is higher in oleic acid and appears to disrupt the skin barrier, while oils higher in linoleic acid appear to improve the skin barrier.<sup>2</sup> Coconut oil (CO) is comparable to mineral oil at improving hydration without altering TEWL and has anti-microbial properties.<sup>3</sup> Jojoba oil (JO) can decrease TEWL and enhance SC moisturization.<sup>4</sup> Almond oil (AO) is rich in antioxidants such as omega and linoleic fatty acids and vitamin E and has occlusive properties comparable to mineral oil.<sup>5</sup>

There is no head-to-head comparison between natural oils and WP for moisturization. This randomized, open label, comparison pilot study aims to compare the ability of natural oils (AO, CO, and JO) and WP to improve xerosis and SBF. This clinical trial was registered on [clinicaltrials.gov](http://clinicaltrials.gov) (NCT03093597) prior to participant enrollment.

## METHODS

Nineteen subjects from University of California, Davis (UCD) in Sacramento and eighteen subjects from University of Arizona (AZ) in Tucson participated in this study (mean age 59.5 years old, range 24-85 years). The study was approved by the Institutional Review Board at both sites, and time period for recruitment and follow-up was January 18, 2017 through July 31, 2017. Baseline TEWL and hydration were not significantly different.

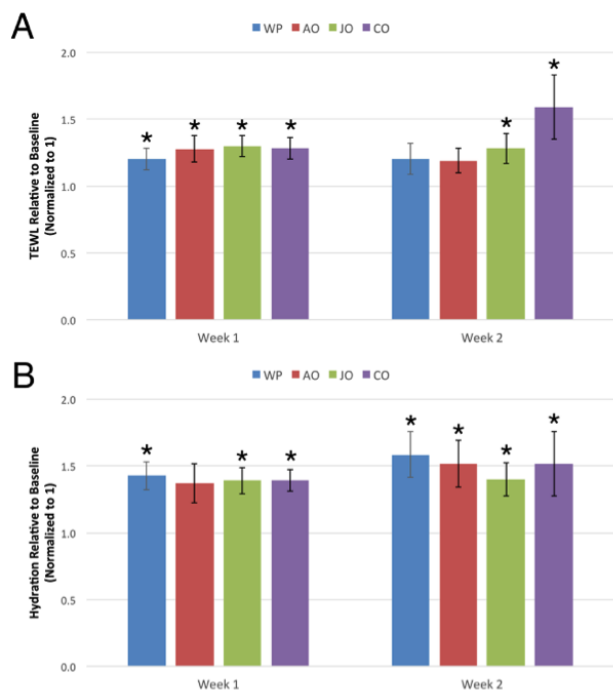
Subjects were supplied with pre-measured certified organic CO (*Nature's Bounty*®), JO (*The Jojoba Company*), AO (*Mountain Rose Herbs*), and WP. Each of the four moisturizers was pre-randomized in blinded envelopes to one of four application areas on the right and left forearms prior to

recruitment. The subjects applied 0.1ml of each moisturizer twice daily to the assigned area for two weeks. TEWL and hydration were measured at baseline, 1 week and 2 weeks using Vapometer and MoistureMeterSC (Delfin Technologies), respectively. Xerosis was graded using the Dry Skin Scale (DSS)<sup>6</sup>, and UCD participants were asked to complete a survey regarding moisturizer preferences at the final visit. Intra- and intergroup evaluations were performed using paired t-test and a Bonferroni correction was implemented to reduce type I error when comparing moisturizers.

## RESULTS

Four subjects were lost to follow-up after the baseline visit, one subject dropped out after week 1 due to scheduling conflicts, and thirty-two subjects completed the week 2 study visit. Outcome measurements are displayed in Figure 1. Neither the TEWL nor the hydration were statistically different among moisturizers at each visit. All moisturizers significantly increased TEWL at week 1 ( $p < 0.05$ ) compared to baseline, and only JO and CO persisted to have a significant increase in TEWL at week 2 ( $p < 0.05$ ).

All four moisturizers significantly increased in hydration by week 2 ( $p < 0.01$ ). There were no significant differences in outcome measurements when data was analyzed separately for each study site. Thirteen participants at the UCD study site completed a survey, and AO was most "liked" (38%), followed by CO (31%). WP was "least liked" (62%). No adverse events were reported.



**Figure 1.** Changes in skin barrier biophysical properties with moisturizer use. Transepidermal water loss (A) and hydration (B) values at week 1 and week 2 visits are normalized to the measurements at the baseline visit. Error bars represent SEM. n=32. \* = p<0.01.

## DISCUSSION

AO, JO, and CO can be as effective as WP in improving SBF in patients with xerosis. Limitations of this study include: assessments localized to forearms, short study period, and relatively low baseline DSS in study subjects. Natural oils can be comparable alternatives to commercially available emollients and are preferred over WP, which may improve patient compliance. Antimicrobial, antioxidant, and anti-inflammatory properties are additional benefits of natural oils. Larger randomized trails that evaluate the benefit of additional natural oils are needed, especially in inflammatory dermatoses associated with barrier defects, such as atopic dermatitis and psoriasis.

**Conflict of Interest Disclosures:** RKS serves as a scientific advisor to Dermveda and serves as a consultant to Dermala and Burt's Bees. VYS has stock options in Dermveda, serves as a consultant for Menlo Therapeutics, Sanofi Genzyme, Burt's Bees, and the National Eczema Association, and has received research funding from Skin Actives Scientific.

**Funding:** ARV received a medical student research grant from Banyan Botanicals. The funding source had no role in data analysis or the decision for publication.

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