WHAM evidence summary: Effectiveness of topical coconut products

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CLINICAL QUESTION

What is the best available evidence on the use of topical coconut products in wound management and treatment of skin conditions?

SUMMARY

Despite the wide use of topical coconut products for medicinal purposes in tropical geographic regions, only a limited number of clinical studies reporting its effectiveness in treating skin conditions and no studies reporting use in wound management were identified is this rapid review. *Level 1* evidence[1, 2] demonstrated that topical virgin coconut oil (VCO) was associated with improvements in signs and symptoms of xerosis[1, 2] and psoriasis[3] in adults, and mild-to-moderate dermatitis in children.[4] There is some evidence that VCO improves scores of skin immaturity in preterm neonates.[5, 6] Currently no evidence is available on the use of topical coconut products for healing human wounds.

CLINICAL PRACTICE RECOMMENDATIONS

All recommendations should be applied with consideration to the wound, the person, the health professional and the clinical context.

Topical virgin coconut oil could be considered for the treatment of mild-to-moderate xerosis (Grade B).

Topical virgin coconut oil could be considered for the treatment of psoriasis in the absence of access to topical corticosteroid therapy (Grade B).

Topical virgin coconut oil could be considered for the treatment of mild-to-moderate atopic dermatitis in children (Grade B).

SOURCES OF EVIDENCE

This summary was conducted using methods published by the Joanna Briggs Institute (JBI).[7-11] The summary is based on a systematic literature search combining search terms related to wounds and skin conditions with terms related to coconut palm. Searches were conducted in Embase, Medline, Global Health, and Allied and Complementary Medicine databases, and in ten health care journals from low- and middle-income countries for evidence published up to May 2021 in English. Studies were assigned a level of evidence (see Table 1) based on JBI's hierarchy.[7-11] Recommendations are made based on the body of evidence and are graded according to the system reported by JBI.[7-11].

Table 1: Sources of evidence and the level

Level 1 Evidence	Level 2 Evidence	Level 3 Evidence	Level 4 Evidence	Level 5 Evidence
Experimental Designs	**Quasi-experimental Designs**	**Observational – Analytic Designs**	**Observational – Descriptive Studies**	**Expert Opinion/ Bench Research**
1.c randomised blinded trials (RCT)[1-6]		3.e Observational study without a control group[12]		5.c Bench research[13-15]

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BACKGROUND

Various parts of the coconut tree have been used for a multitude of purposes in traditional medicine for thousands of years, to the extent that the plant is often called the 'tree of life'[16]. Products derived from *Cocos nucifera Linn: Arecaacae* include coconut water, oil from coconut milk or copra (dried kernel), dried coconut shell and husk fibre[17, 18]. The most used coconut product, virgin coconut oil (VCO) is extracted directly from coconut flesh and contains medium chain fatty acids that have surfactant qualities.[1, 19, 20] Another tested product, coconut shell liquid smoke (CS-LS) is produced by burning coconut shells at 400° C resulting in a solution arising from condensation of vapour of wood smoke.[14] Coconut shells contain the highest antioxidant properties of any parts of the coconut.[14]

Laboratory testing and biochemical analysis of these products have identified a number of useful properties e.g. anti-inflammatory, antimicrobial, antifungal, antioxidant, antineoplastic and analgesic[17, 18, 20-24]. When applied topically, VCO provides barrier protection for the stratum corneum and reduces trans-epidermal water loss (TEWL), promoting skin moisturisation[19, 20, 24, 25]. When used on wounds, VCO and other coconut-derived products are reported to promote collagen synthesis and faster epithelisation[15, 20, 24].

EVIDENCE

Evidence from animal studies

Evidence on the wound healing effect of coconut comes from animal studies. Results from three studies[13-15] are provided as examples of the significant amount of laboratory work on this topic. In the first study,[13] undertaken in India, VCO was applied daily for 10 days to open dermal wounds in rats. There were three groups of six rats each: control group, a group treated with 0.5 ml VCO, and the third treated with 1 ml VCO. Time to complete epithelisation and composition of granulation tissue (e.g., collagen and fibroblasts) were among the outcome measures. In terms of both time to complete epithelisation and total collagen content, groups 2 and 3 were statistically significant compared to the control ($p < 0.05$), 1 ml being more effective than 0.5 ml[13] (*Level 5*).

The second study[14] was conducted in Indonesia to evaluate healing activity of CS-LS for burns. Thirty-six mice were randomised into three groups (n = 12/group): CS-LS, normal saline 0.9% (NaCl), and 10% povidone iodine. The burn wounds were left open, with treatment applied twice daily for 25 days. Wound contraction was measured on days 1, 5, 10 and 25 after burn induction. The CS-LS group showed the fastest wound contraction of the three groups by day 5 ($p < 0.001$). On day 10 there was a statistically significant difference to the povidone iodine group ($p < 0.001$) and on day 25 there was a statistically significant difference to the NaCl group ($p < 0.05$)[14] (*Level 5*).

In the third study,[15] VCO for treating diabetic ulcers was explored with a rat population. Rats with ulcers were divided into four groups: non-treated, non-diabetic rats (n = 18), non-treated diabetic rats (n = 18), diabetic rats receiving 1 ml VCO applied daily for 14 days (n = 18) and diabetic rats receiving silver sulfadiazine cream applied daily for 14 days (n = 18). Wound closure rates were measured on day 5, 10 and 14. Diabetic ulcers treated with VCO had statistically significantly faster closure rates ($p < 0.05$) compared with diabetic ulcers receiving no treatment on all days. On days 5 and 14 there was a statistically significant difference between the VCO and the silver sulfadiazine cream groups ($p < 0.05$), favouring VCO[15] (*Level 5*).

Evidence on effectiveness for treating wounds

No evidence on topical coconut products for use in treating human wounds was identified.

Evidence on effectiveness for treating skin conditions

<u>Xerosis in adults</u>

Two blinded RCTs[1, 2] provided evidence for using VCO to relieve xerosis (dry skin) in adults. The first RCT[1] was conducted on 34 individuals with mild-to-moderate xerosis to determine the effectiveness and safety of VCO compared with mineral oil when used as a therapeutic moisturiser. The solutions were applied to the legs twice daily for 14 days. Skin hydration and skin lipids were tested to measure effectiveness while transdermal water loss (TEWL) and skin pH were the quantitative measures for safety. Xerosis was evaluated for dryness, scaling, roughness and pruritus by both an investigator using Wehr's Grading and by participants using a visual analogue scale. Data were collected at baseline, day 7 and day 14. Participants also evaluated side effects (e.g., erythema, stinging, or itching). Both treatments were comparable in terms of outcome measures for effectiveness and safety. By the end of the study 81% (13 of 16) of the participants in the VCO group showed improvement of at least one level in xerosis grading compared to 72% (13 of 18) of the mineral oil group[1] (*Level 1*).

The second RCT[2] compared VCO to virgin olive oil (VOO) for relieving xerosis and eliminating *Staphylococcus aureus* from skin in adults with atopic dermatitis (n = 52). One group was treated with VCO and the other with VOO, with oils massaged gently into the skin twice daily at two

skin sites displaying no clinical signs of infection. Outcome measures were skin cultures, photography and the objective component of the SCORAD severity index (0-SSI). Assessment occurred at baseline and at 4 weeks. At four weeks, the VCO group improved more significantly on the 0-SSI compared to the VOO group ($p = 0.004$)[2]. Of the VCO group, 77% (20 of 26) were positive for *S. aureus* on entry to the study compared 46% (12 of 26) in the VOO group. Following treatment only 5% (1 of 12) of the VCO group remained positive versus 50% (6 of 12) of the VOO group. The relative risk for VCO was 0.1 compared to 10.1 for VOO ($p = 0.00$; 95% confidence interval [CI], 0.01-0.73, number needed to treat [NNT] = 2.2) (*Level 1*).

Psoriasis in adults

Two studies provided evidence on use of coconut oil for treating psoriasis. In an RCT (n = 40), adults with scalp psoriasis were randomised into three groups to assess the effectiveness of relatively bland emollients: 5% coal tar solution plus coconut oil (1:1); 10% urea, 10% lactic acid, 10% propylene glycol plus 10% liquid paraffin (in a cream base); and VCO alone. All three groups showed comparable significant improvement over time, showing 57%, 64.4% and 58.3% clearing of symptoms respectively ($p < 0.01$) without adverse effects. The authors noted that topical corticosteroids have demonstrated substantially higher response and clearance rates than this study found[3] (*Level 1*).

An observational study (n = 31)[12] explored the use of VCO applied twice daily for 8 weeks to psoriasis lesions in adults. Erythema, scaling and plaque elevation were evaluated every second week using photography and a clinical assessment of symptom clearance. At the completion of the study 16% of participants (5 of 31) had complete clearance. Scaling was observed to be most reduced in the 4-to-6-week period of treatment, while erythema and plaque elevation were most improved in the 6-to-8-week period. No adverse effects were experienced[12] (*Level 3*).

Dermatitis in children

One RCT[4] (n = 117) compared the effectiveness of topical VCO to that of topical mineral oil for children (aged between 1 and 13 years) with mild-to-moderate atopic dermatitis. For both treatment groups, 5 ml of oil was applied twice daily. Impact on epidermal function was measured using a clinical assessment tool (SCORAD severity index) and by measuring transdermal water loss (TEWL) and skin capacitance, all measured at baseline and 2, 4 and 8 weeks. On the SCORAD measure the VCO was significantly more effective than the mineral oil (mean reduction in symptoms 68.23% versus 38.13%, $p < 0.001$). The VCO also produced significantly effective results in terms of the TEWL over the 8-week period compared to the mineral oil group (decrease in water loss 70.7% versus 35.36%). In terms of the emollient effect of the two oils, a statistically significant difference between the two became apparent at 8 weeks of treatment ($p = 0.03$). No adverse effects were reported in the VCO group, while five children in the mineral oil group required 'rescue' treatment with topical corticosteroids[4] (*Level 1*).

Treatment of immature skin in preterm neonates

Two non-blinded RCTs,[5, 6] investigated application of VCO to preterm neonates to promote skin maturity. In both studies, skin maturity was assessed on days 7, 14 and 21 using the Neonatal Skin Condition Scale (NSCS) that includes evaluation of dryness, erythema and skin breakdown. In both studies, babies with existing skin conditions (e.g., infection or rash) were excluded.[5, 6]

In the largest RCT (n = 2,294),[5] preterm neonates (< 37 weeks) were randomised to a treatment group receiving 5 ml VCO applied four times daily or to a control group receiving massage only (no topical treatment). Babies receiving VCO had statistically significantly better NSCS scores than the control group at day 7, 14,21 and 28 ($p < 0.01$) and were significantly less likely to experience a decrease in skin maturity ($p < 0.01$) or hypothermia ($p < 0.01$), without increase in adverse events including rash or accidental slippage of the baby. However, parents were significantly more likely to rate the intervention as cumbersome (2% versus 0.3%, $p < 0.001$) (*Level 1*).

In the second RCT,[6] 72 preterm babies (n < 30 weeks) received either no topical emollient (n = 36) or 5 ml / kg VCO applied twice daily over the body (excluding face, scalp and around medical devices). After 3 weeks of treatment, NSCS score declined for the babies in the control group but remained stable for those receiving VCO ($p = 0.01$). There was no significant difference in adverse events including skin irritation or temperature instability[6] (*Level 1*).

Due to methodological limitations of these studies, more evidence is required to recommend VCO for routine care of immature neonate skin. However, available research suggests that the practice is safe to explore.[5, 6]

CONSIDERATIONS FOR USE

- When used as a skin moisturiser, VCO is applied to adults and children by rubbing directly on skin and/or lesions, usually twice daily[1, 2, 4, 12, 22].
- Topical application of VCO for mild-to-moderate skin conditions is associated with a lower rate of adverse effects than topical corticosteroids[4, 12].
- To apply VCO to the immature skin of very preterm neonates, stroke the oil onto skin for 2-3 minutes

without massage during routine care to avoid excessive handling[6].

CONFLICTS OF INTEREST

The author declares no conflicts of interest in accordance with International Committee of Medical Journal Editors (ICMJE) standards.

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ABOUT WHAM EVIDENCE SUMMARIES

WHAM evidence summaries are consistent with methodology published in

Munn Z, Lockwood C, Moola S. The development and use of evidence summaries for point of care information systems: A streamlined rapid review approach, Worldviews Evid Based Nurs. 2015;12(3):131-8.

Methods are provided in detail in resources published by the Joanna Briggs Institute as cited in this evidence summary. WHAM evidence summaries undergo peer-review by an international review panel. More information on the website: http://WHAMwounds.com

WHAM evidence summaries provide a summary of the best available evidence on specific topics and make suggestions that can be used to inform clinical practice. Evidence contained within this summary should be evaluated by appropriately trained professionals with expertise in wound prevention and management, and the evidence should be considered in the context of the individual, the professional, the clinical setting and other relevant clinical information.

PUBLICATION

This evidence summary has been published in:

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