

# Coconut oil – Nature’s own emollient

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## Introduction

The coconut (*Cocos nucifera* L., family Arecaceae) is an important fruit tree, especially in tropical and subtropical regions. It is known as “kalpa vriksha” in Sanskrit, which literally means it supplies all the necessities. It is also called the “Tree of Life” in the Philippines because it provides food for millions of people.<sup>1,2</sup> All parts of the coconut palm are useful, but ‘copra’, the dried mainly used for oil extraction, contains 65–75% oil.<sup>3</sup> Coconut oil is of two types: virgin and refined coconut oil. It is commonly used as a moisturiser for many dermatological conditions.<sup>4</sup> The current review summarises the data regarding the uses of coconut oil in dermatology.

## Coconut oil and its preparation

### Coconut Copra oil

The coconut kernel is dried in sunlight, and the oil is collected by milling. Then, the oil is sun dried to remove the moisture content.<sup>5</sup>

### Coconut testa oil

It is extracted from the coconut testa oil (CTO) using isopropyl alcohol.<sup>6</sup> CTO is best obtained at a temperature of 60°C for a period of 3 h with the substrate-to-solvent, ratio of 1:4.<sup>3</sup>

### Virgin coconut oil (VCO)

It is extracted naturally from the fresh coconut kernel without the application of high temperature or chemical treatment. The process of extracting virgin coconut oil from mature coconuts is illustrated in the flowchart [Figure 1]. Based on the mode of preparation, several types of VCO are obtained by cold extraction, hot extraction, fermentation technique, enzymatic extraction, wet extraction, and chilling, freezing, and thawing techniques.<sup>5</sup>

## Properties of coconut oil

### Physical properties

Coconut oil is liquid above 30°C, solidifies at 25°C, and forms an opaque, white solid. It has a smoking point of 170°C unrefrigerated, 232°C refrigerated, and forms a white emulsion with water.<sup>7</sup>

### Nutritional value

With regard to nutritional value, 100g of coconut oil has 892 kcal (or 3730 kJ) of energy. A sample of 100 g of coconut oil contains 99.06 g of fat in total. Additionally, 1 mg of calcium, 0.05 mg of iron, 0.02 mg of zinc, and 0.3 mg of choline are present in coconut oil. A 100 g sample contain 0.11 mcg of vitamin E.<sup>7,8</sup>

### Biological effects of coconut oil

- Anti-inflammatory and antioxidant property:** Topical application of VCO exerts anti-inflammatory activity by inhibiting various cytokines, including TNF- $\alpha$ , IFN $\gamma$ , IL-6, IL-5, and IL-8.<sup>9</sup> The mechanisms by which it exerts this property are 1) Downregulated (inducible nitric oxide (NO) synthase) iNOS expression. 2) Decreased cyclooxygenase-2 (COX-2) expressions. 3) Inhibited tumour necrosis factors (TNF- $\alpha$ ) activity. 4) Downregulated Interleukin-6 (IL-6) expression. 5) Enhanced Glutathione (GSH) and superoxide dismutase (SOD) activity, and 6) Decreased lipid peroxidation. Cultured coconut extract (CCE) exhibited increased expression of collagen and hyaluronan synthase-3. CCE demonstrated barrier-enhancing effects and anti-inflammatory properties in response to ex vivo UVB irradiation-induced inflammation.<sup>10,11</sup>
- Effects on hair:** Coconut oil is reputed to have numerous benefits for the scalp and hair, including:

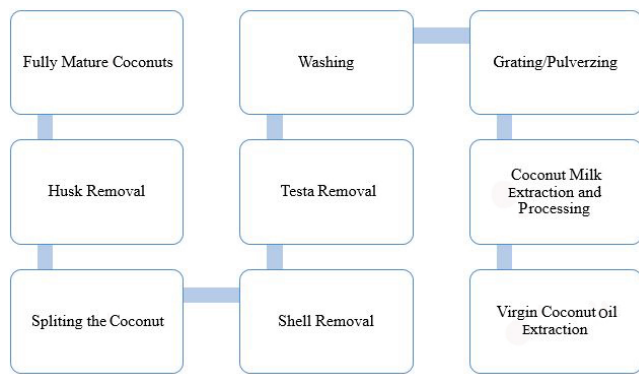
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**Figure 1:** This flow diagram outlines the sequential steps in the production of virgin coconut oil from fully mature coconuts.

- a. **Saponification:** Being an effective saponification agent, coconut oil is commonly used in shampoos.<sup>12</sup>
- b. **Emollient properties:** Coconut oil creates a protective layer on the hair shaft, sealing the cuticle and retaining moisture.<sup>13</sup>
- c. **Lubricant:** It enhances the slip between hair strands, making it easier to detangle, smooth, and flatten the cuticle, improving the hair’s health and appearance.<sup>14</sup>
- d. **Protein loss prevention:** Its low molecular weight and straight linear chain structure enables its penetration into the hair shaft, helping to prevent protein loss.<sup>15</sup>

These benefits have led to the widespread use of coconut oil in various regions globally.<sup>16</sup>

3. **Moisturiser:** Coconut oil is an affordable, natural moisturiser, particularly beneficial in places like India. A study by Agero *et al.*<sup>17</sup> found it to be more effective than mineral oil for xerosis, although not statistically significant. Both oils were safe, with no adverse reactions or positive patch-test results.<sup>17</sup> The difference between mineral and coconut oil is shown in Table 1.
4. **Photoprotection:** Coconut oil has a sun protection factor of 7.1 blocking 20% of UV radiation, making it an effective ingredient in sunscreens among fixed oils.<sup>17,18</sup>
5. **Wound healing:** The cumulative effect of polyphenols, catechins, ferulic acid, p-coumaric acid, caffeic acid, unidentified phenolic acid, and unidentified flavonoids helps in faster wound healing.<sup>6</sup>
6. **Miscellaneous effects:** These include antipyretic, analgesic, and immunomodulatory effects.<sup>19</sup>

**Specific uses in Dermatology**

Products derived from coconut oil have been used as oils for various skin and hair ailments since ancient times in traditional medicine.<sup>20</sup>

1. **Xerosis:** Coconut oil, an inexpensive and safe moisturiser, is effective for all skin types, especially dry skin. It is widely used in cosmetics like soaps, lotions, and creams for skin hydration.<sup>21</sup>

**Table 1: Comparison of mineral and coconut oil**

Parameters	Coconut oil	Mineral oil
Source	An oil extracted from coconuts	A chemical substance derived from crude petroleum oil
Composition	Composed of fatty acids, primarily lauric acid, and other nutrients	Composed of hydrocarbons
Nutrition value	Rich in essential fatty acids, antioxidants, and vitamins.	Contains no essential nutrients
Absorption	Easily absorbed by the scalp and hair strands. It is also easily absorbed in the skin.	It sits on the surface of the hair and skin, forming a barrier.
Usage	Used in a wide range of hair care products like shampoos, conditioners, and masks.	Common in hair serums and protective sprays.
Moisturising effect	Penetrates the skin and hair shaft to provide deep moisture.	It creates a barrier to lock in moisture but doesn’t provide hydration.
Skin benefits	Has antibacterial and antifungal properties, beneficial for skin health.	It can sometimes clog pores and cause acne when used on the skin.
Side effects	Does not harm skin and hair	Excessive use can damage hair
Environmental impact	Renewable and more environmentally friendly.	Non-renewable resources with a larger carbon footprint.
Application	Used for its nourishing and hydrating qualities.	Often used for its barrier-forming properties.

2. **Hair:** Coconut oil, rich in lauric acid, is the best natural hair nutrition, promoting growth and lustre. Its low molecular weight and affinity for hair proteins allow it to penetrate the hair shaft effectively. In South India, it’s applied daily after bathing, serving as an excellent conditioner that repairs damaged hair, provides essential proteins, and strengthens hair against damage. Regular use can also prevent pediculosis and seborrheic capitis.<sup>21,22</sup>
3. **Atopic Dermatitis:** Virgin coconut oil (VCO) helps prevent TransEpidermal Water Loss (TEWL), strengthening the skin’s barrier and improving hydration. It has antioxidant, anti-inflammatory, antibacterial,<sup>23</sup> wound healing, and moisturising properties, beneficial for managing Atopic Dermatitis (AD). A randomised, double-blind clinical trial by Evangelista MT *et al*<sup>24</sup> showed VCO was more effective than mineral oil over eight weeks in children with mild to moderate AD, based on Scoring Atopic Dermatitis (SCORAD) index and trans-epidermal water loss (TEWL) and skin capacitance evaluations.<sup>23,24</sup>
4. **HIV and Cancer:** Preliminary studies suggest that coconut oil may have a significant impact on lowering the risk of viral infections in individuals with HIV and cancer. Initial research findings point towards the potential of coconut oil in diet decreasing the viral load in HIV patients.<sup>25</sup>
5. **Aesthetics:** It delays the appearance of wrinkles and sagging of skin. Coconut oil helps prevent premature

ageing and degenerative diseases due to its antioxidant properties.<sup>21</sup>

- Oil pulling:** Oil pulling, a traditional Ayurvedic practice from ancient India, involves swishing coconut oil in the mouth for oral health benefits. It improves gingival health by reducing inflammation and bleeding, prevents dry mouth, throat, and chapped lips, reduces halitosis, and enhances overall oral hygiene.

#### Adverse effects

- Acne and comedones: Oils form an occlusive film over the applied area and cause comedogenesis and aggravation of acne in the acne-prone areas.<sup>26</sup>
- Folliculitis: Oils also cause scalp, limbs, and torso folliculitis when applied excessively due to their occlusive property.<sup>26</sup>
- Mudichood dermatitis: It is commonly seen in young women from Kerala, India, due to the habit of leaving residual coconut oil and other medicated (Ayurvedic) oils in the hair after a bath, which produces itchy pigmented to lichenoid papular lesions over the neck and upper back when coming into contact with the skin.
- Dermatitis cruris pustulosa et atrophicans (DCPA): Coconut oil can cause aggravation of DCPA. Jacyk suggested that occlusion, leading to increased stratum corneum hydration, makes DCPA worse because moist skin has a higher friction coefficient than dry skin and is more vulnerable to trauma.<sup>27</sup>

#### Conclusion

Coconut oil has long been recognised as an effective moisturiser, particularly in regions like India and Southeast Asia, where it is widely used for conditions such as xerosis, eczema, and ichthyosis. However, its use in developed countries remains less common, and the current body of evidence supporting its efficacy is still limited. It is imperative to conduct well-designed trials to establish the benefits of coconut oil as a moisturiser and explore its potential in other dermatological disorders. Such research would help in bridging the evidence-gap and provide a stronger foundation for its broader acceptance in clinical practice.

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