

## Chocolate and Skin: The Impact of an Insatiable Indulgence

### Abstract

Chocolate is the most sought-after delicacy worldwide. Cocoa has been incorporated in various forms, into both foods and cosmetics. Cocoa has not only been used as gourmet food but has also served as medicine for ages. Chocolates are always in vogue and remain a testament to the cocoa bean, but the benefits attained from commercial chocolates remain a fallacy. On a positive note, chocolate has its health benefits but its effects on the skin need a better understanding. Hence this article focuses on the dermatological effects of cocoa, and its use as a dermatological therapeutic agent.

**Keywords:** *allergy, chocolate, cocoa, flavanols, nickel*

### Introduction

Chocolate, a popular food product made from roasted cocoa pods [Figure 1], is consumed worldwide. Though cocoa is the main component of chocolate and is responsible for its beneficial effects, it is bitter and unpalatable in its pure form. The metamorphosis of cocoa into chocolate makes it the most widely consumed food worldwide. This process makes it sweeter; however, the bitter side is the problems inherent with the additives. For years it has been a see-saw battle between the assets and liabilities of chocolate on human health. This article focuses on the benefits and ill effects of cocoa and chocolate.

### Beneficial effects of cocoa and its components

Cocoa offers various benefits to health because of its bioactive moieties [Table 1]. Cocoa has a diverse chemical profile and its natural flavonoids and polyphenolic antioxidants serve the areas of recent interest in the literature on medicine. Cocoa flavanols and bioactive compounds have a beneficial effect on various health conditions.<sup>[1,2]</sup> They also contain theobromine, which protects the teeth enamel, and along with caffeine cause bronchodilatation.<sup>[3]</sup>

### Cocoa and cosmetics

Cocoa butter is a common and universal component of skin moisturizers and high-quality soaps.<sup>[4]</sup> The cocoa pod husk

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potash soap is an all-natural soap with food-grade oils.<sup>[5]</sup> African black soap made with a dye derived from cocoa beans is beneficial to skin health.<sup>[6]</sup> The use of cocoa pod extracts such as flavonoid component helps prevent wrinkles.<sup>[7]</sup> Cocoa inhibits the breakdown of the dermal matrix and thus offers a reduced wrinkle effect.<sup>[8]</sup> Cocoa butter cream and lotions are commercially available for use to prevent striae gravidarum, but two studies reported no role in striae prevention.<sup>[9,10]</sup>

### Cocoa and skin

Cocoa is a boon to the skin, the utility of which remains unexplored. The vasodilatory activity of flavanols contributes to enhanced skin microcirculation and thermoregulation, and thus improves skin hydration.<sup>[11]</sup> The anti-inflammatory and antioxidant properties of flavanols play a significant role in shielding the skin from toxic ultraviolet rays, thus protecting against photocarcinogenesis.<sup>[5,12-14]</sup>

### Chocolate and skin diseases

Chocolate not only has beneficial effects on the skin due to cocoa but also has deleterious consequences due to the additives [Table 2]. The high sugar and milk products alter the calorific content of many chocolates, thus making it a nightmare for many diet-conscious individuals.

### Chocolate and acne

The impact of chocolate on acne is attributed to both cocoa and its high glycemic index.

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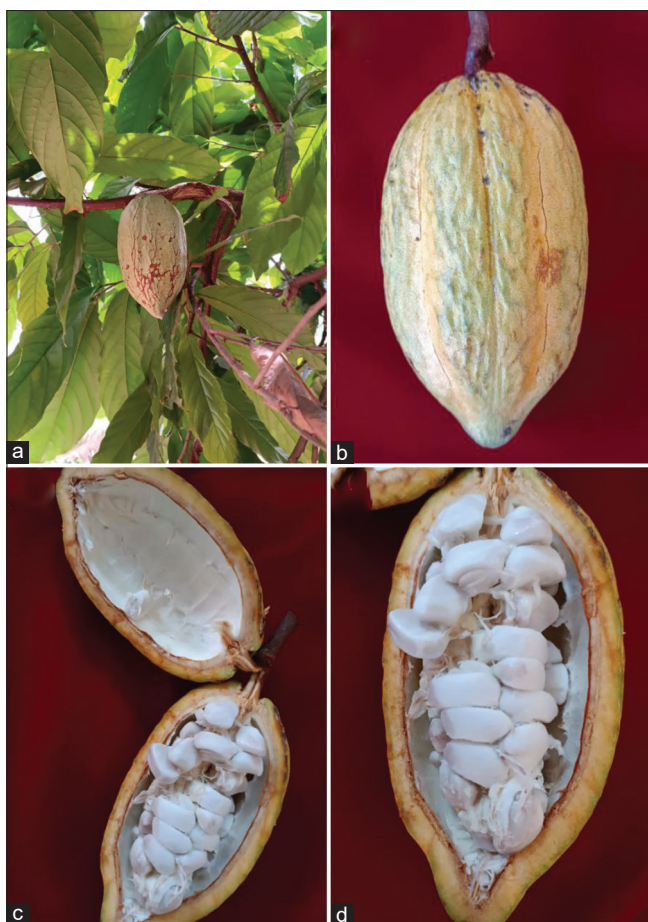


Figure 1: (a- d) Cocoa pod with cocoa beans

High chocolate consumption had no effect on sebaceous secretion and hence on acne vulgaris, according to a study conducted by Fulton *et al.*<sup>[15]</sup> Further research antithetically proved that consumption of chocolate flavonoids modulates cytokine production, which inevitably leads to increased inflammation and thus exacerbates acne vulgaris.<sup>[16]</sup> There is increased epidermal corneocyte desquamation and an increased presence of gram-negative micro-organisms on the facial skin surface.<sup>[17]</sup> The high content of cocoa butter and oleic acid in dark chocolate modifies follicular epi-keratinization and precipitates the development of comedones.<sup>[18]</sup> Subsequently, the intake of dark chocolate increases inflammatory as well as non-inflammatory lesions on the acne-vulnerable skin.<sup>[17-19]</sup> The high glycemic index worsens acne and makes it last longer.<sup>[5]</sup> Chocolate consumption also causes a rise in acne vulgaris in men who have had acne before.<sup>[20]</sup> The high-fat content in white chocolate was found to exacerbate acne lesions in acne-prone populations.<sup>[21]</sup>

### Chocolate and atopic dermatitis

The role of chocolate in atopic dermatitis is debatable with conflicting studies. In a Japanese study, chocolate is thought to be the most common offending substance in people with atopic dermatitis.<sup>[22]</sup> It not only aggravated pre-existing

Table 1: Bioactive moieties of cocoa

Polyphenol	Compounds
Flavan-3-ols (Catechins)	(-)-epicatechin, (+)-catechin, (+)-gallocatechin, (-)-epigallocatechin
Anthocyanidins	cyanidin-3- $\alpha$ -L-arabinoside, cyanidin-3- $\beta$ -D-galactoside
Proanthocyanidins	Dimers, trimers, and oligomers of flavan-3,4-diols

Table 2: Components of a commercially sold chocolate

Cocoa
Milk solids
Fats
Sugar
Sweeteners
Preservatives
Flavoring agents
Colors
Nuts and fruit

lesions but also caused new lesions.<sup>[23]</sup> Maternal chocolate consumption has been found to aggravate eczema in exclusively breast-fed babies. An exacerbation of pre-existing eczema, as well as a new papular eruption of an infant's uninvolved skin, has also been noted. Chocolate is also known to cause systemic metal allergy, triggered by the mother's breastfed milk, thus causing pompholyx in the infant. Therefore, any infantile atopic dermatitis should raise the suspicion of maternal consumption of cocoa and tree nut-related foods. A study from Italy concluded, on the contrary, that atopic children did not have chocolate hypersensitivity.<sup>[24,25]</sup>

### Chocolate as an allergen

Chocolates can have metals such as lead and nickel in them.<sup>[26,27,28]</sup> The nickel content in confectionary chocolate bars was very negligible to cause reactions, according to Dohnalova *et al.*<sup>[27]</sup> In nickel-sensitive people, cocoa can cause systemic contact dermatitis, which is more common with dark chocolate (0.5 mg/kg) than with milk chocolate (0.1–0.5 mg/kg).<sup>[29-31]</sup> Chocolate-enrobed nuts and milk solids in the processing can cause reactions due to cross-contamination.<sup>[23]</sup> Chocolate spread with small amounts of hazelnuts and almonds can trigger allergic reactions.<sup>[32,33]</sup> Theobromine and caffeine can cause pseudo-allergies. Although chocolate is a source of vitamins, minerals, and polyphenols, it can cause IgE-mediated cocoa allergies.<sup>[23]</sup> Hence, recalcitrant dermatitis in kids should raise the suspicion of chocolate allergy. Chocolate-induced dermatitis has also been reported in individuals, sensitive to *Myroxylon pereirae* (balsam of Peru).<sup>[30]</sup> Sensitization to chocolate has also been noticed in chocolate confectionery workers, prone to asthma.<sup>[23]</sup> The lead content was found to be 230 ng/g chocolate, raising reactions in sensitive individuals.<sup>[28]</sup>

**Table 3: Allergens in chocolate**

Lead
Nickel
Theobromine
Caffeine
Milk solids
Nuts: Hazelnuts, almonds, peanuts

Chocolate can cause several cutaneous allergic reactions such as urticaria, eczema, local or generalized pruritus, circumoral erythema, morbilliform, scarlatiniform eruptions, and redness of ears. Systemic symptoms such as severe headache, rhinorrhea, sneezing, wheezing, nausea, and cramps too can occur.<sup>[34]</sup> Chocolate may also trigger adrenergic urticaria, a condition in which serum catecholamines and IgE levels rise.<sup>[35]</sup> The possible allergens in chocolate are mentioned in Table 3.

### Conclusion

Cocoa and cocoa derivatives are rich in phytochemicals that have both nutritious and medicinal properties. A large number of research studies have emerged supporting the antioxidant, anti-inflammatory, and endogenous photoprotective properties of cocoa; however, the role of cocoa remains to be explored. In the form of chocolate, many of its benefits are over-hauled by the other ingredients added to it. Chocolate is the most sought-after indulgence by mankind and will remain to do so in the future. The various ways of making it healthier remain in the hands of the industry and the consumer.

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### Conflicts of interest

There are no conflicts of interest.

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