



## Prevalence of Allergen Contents in Marketed Hand Cream Products in Thailand: A Survey

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### Abstract

Hand eczema, a prevalent inflammatory dermatological disorder, manifests as pruritic erythematous papules/vesicles, or plaques, which often progress into thick hyperkeratotic lesions with painful fissures. The enduring nature of these symptoms significantly impacts patients' quality of life, prompting the implementation of early preventive measures and effective treatments to alleviate the chronicity of the condition. Hand cream, endowed with prophylactic and therapeutic properties, is pivotal in hand eczema management. However, it is imperative to acknowledge the potential presence of allergens in hand creams, which may exacerbate symptoms. Thus, conducting a comprehensive market survey to assess allergen content holds promise for enhancing patient outcomes. This study aimed to investigate allergen prevalence in Thai hand cream products. Data on 105 hand cream ingredients was meticulously collated from 19 stores via online and in-store methods. The findings revealed that hand cream products in Thailand encompass major allergens, notably Fragrance, Phenoxyethanol, and Tocopherol, constituting 68.57%, 64.76%, and 43.81% of the products, respectively. Intriguingly, Lanolin and Propylene glycol, recognized as common allergens in previous studies, were less frequently found. Nearly 25% of the available hand cream on the market have no fragrance, lanolin or propylene glycol. These results underscore the significance of allergen awareness and informed product selection in managing hand eczema. These findings highlight the importance of allergen awareness and informed product selection in the management of hand eczema.

**Keywords:** *Hand Eczema, Prevalent of Allergens, Survey, Hand Cream Product*

### 1. Introduction

Hand eczema is a prevalent inflammatory dermatological condition affecting individuals across all demographic groups. Studies estimate a lifetime prevalence of approximately 14.5% in the general population (Quaade et al., 2021). The pathogenesis of hand eczema involves both endogenous factors, such as genetic predisposition, and exogenous factors, including exposure to irritants and allergens (Thyssen et al., 2010). The clinical presentation of hand eczema encompasses a spectrum of manifestations ranging from erythematous pruritic papules or vesicles to plaques with scales, and in some cases, progresses to thick hyperkeratotic plaques with painful fissures, depending on the course of the disease (Wu et al., 2021).

The management of hand eczema encompasses a plethora of topical and systemic therapeutic approaches. Among these, hand cream stands out as a versatile treatment modality capable of preventing and alleviating symptoms, primarily by serving as a moisturizer. Its widespread availability, diverse product options, and additional appealing features have contributed to its increasing popularity among patients with hand eczema.

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Hand cream is commonly perceived as a safe option for preventing and treating hand eczema. However, it is essential to note that its ingredients may contain several allergens that have the potential to exacerbate symptoms associated with hand eczema.

Ingredients in a product comprise a spectrum of chemical compounds originating from both natural and synthetic sources, serving diverse roles including emulsification, preservation, thickening, moisturization, coloring, and fragrance. While some ingredients have the propensity to trigger allergic reactions or allergic contact dermatitis in individuals, not all ingredients possess allergenic properties. An allergen specifically refers to an ingredient in the product capable of inducing allergic reactions.

From previous studies, common allergens found in moisturizers include Fragrance, Paraben, Vitamin E, Essential oils, Benzyl alcohol, Propylene glycol, Formaldehyde, Iodopropynyl butylcarbamate, Lanolin, and Kathon CG, orderly (Zirwas & Stechschulte, 2008). Moreover, according to three previous studies investigating the most common allergens associated with positive patch tests in patients with hand and/or foot eczema, these allergens include Nickle, Quaternium-15, Fragrance, MI/MCI, Balsam of Peru, Carba mix, Thiuram mix, Cobalt, Formaldehyde, Propylene glycol, and Lanolin (Silverberg et al., 2022; Silverberg et al., 2021; Suzuki et al., 2023).

Fragrance refers to fundamental ingredients utilized in material production or manufacturing due to their distinctive smell (González-Muñoz et al., 2014). It is the second most common allergen in cosmetic products, with allergic reaction prevalence ranging from 0.7-2.6% in the general population (Reeder, 2020). The formulation referred to as Fragrance Mix I comprises a 1% concentration of eight distinct compounds: amylcinnamaldehyde, cinnamyl alcohol, cinnamic aldehyde, hydroxycitronellal, geraniol, eugenol, isoeugenol, and either oak moss extract or Evernia prunastri, alongside amylcinnamaldehyde. Fragrance mix I hold notable diagnostic significance in the identification of fragrance allergies, with the capacity to detect approximately 70% to 80% of cases. Conversely, Fragrance mix II encompasses six fragrances: Lyrall, 3,7 dimethyl-[2,6]-octadienal or citral, farnesol, hexyl cinnamic aldehyde, coumarin, and citronellol (González-Muñoz et al., 2014).

Lanolin combines sterols, fatty alcohols, and fatty acids from the secretion of the sheep's sebaceous gland (Knijp et al., 2019). Its properties provide moisture and soothe the skin, which are commonly found in ingredients of cosmetic products. It was named - an allergen for the year 2023 (Nagorka, 2023). The prevalence of allergic reactions to lanolin is 1.2% to 6.9%, according to several studies (Knijp et al., 2019).

Propylene glycol is one of the common allergens contained in cosmetic products. It functions as a humectant to maintain skin hydration. The reported prevalence of allergic reactions ranges from 0.1% to 3.8%. However, the irritating effect of propylene glycol may cause a false positive allergic reaction (Zirwas).

Phenoxyethanol is one of the most commonly used preservatives in cosmetics and is also found in industrial products, including metalworking fluid. A retrospective study conducted by the Information Network of Departments of Dermatology (IVDK) revealed a very low sensitization rate of 0.24% among 6932 individuals who underwent patch testing in Germany, Austria, and Switzerland between 1996 and 2009 (Kolodziej et al., 2022).

Tocopherol functions as a commonly utilized preservative within cosmetic compositions, owing to its antioxidative characteristics and moisturizing attributes. According to an online survey assessing the prevalence of allergenic constituents in "Clean" Beauty Products conducted in the United States in 2020, Tocopherol emerged as the third most frequently recognized allergen, detected in 37% of all products surveyed, particularly abundant in sunscreens. In a patch-testing study involving 4943 patients, a mere 0.7% demonstrated a positive response to tocopherol (Tran et al., 2022).

Given that a significant proportion of patients with hand eczema experience chronic symptoms that profoundly affect their daily life activities, quality of life, and socioeconomic status, the direct and indirect



costs of treatment can be substantial (AB, 2023). Consequently, conducting a market survey on hand cream ingredients and investigating the prevalence of allergens in hand cream products in Thailand could offer significant advantages. This data would prove invaluable for patients suffering from hand eczema, providing them with the latest market insights on allergens in hand creams in Thailand, thereby facilitating informed decisions regarding treatment options aimed at mitigating disease severity while minimizing adverse effects. Furthermore, such information could serve the broader population by serving as an effective preventative measure against the onset of hand eczema.

## 2. Objectives

To investigate the prevalence of allergen content in hand cream products in the Thai market

## 3. Materials and Methods

This study conducted a market survey in Thailand, with inclusion criteria encompassing all hand cream products available in selected stores. Stores were chosen based on three categories: cosmetic retail stores, convenience stores, and department stores. The selection aimed to capture a comprehensive range of hand cream products reflecting consumer behavior. The top 15 stores from each category were recruited based on their total income in 2022, sourced from the Department of Business Development's official website. Exclusion criteria comprised stores without hand cream availability, hand cream products lacking approval from the Thai FDA, those with unclear ingredient labeling, and products withdrawn during the study period.

The data for each hand cream product was meticulously documented, comprising details such as the store name, company name, product name, formulation, manufacturing country, specific indications, and price (in bath per gram). Ingredients were systematically categorized into six main groups: fragrances, preservatives, emulsifiers, moisturizers, UV filters, and other constituents.

SPSS (Statistical Package for Social Science) was used to analyze the data. Categorical variables were indicated in number or percentage, while continuous variables were expressed as the mean and standard deviation or median.

## 4. Results and Discussion

### 4.1 Results

This market survey was performed between August and December 2023. It encompassed the top 15 stores in each category, sourced from the Department of Business Development website, as per their total income ranking in 2022. Out of the 45 surveyed stores, 26 were omitted due to the absence of hand cream products. Consequently, a total of nineteen stores were selected from three categories: cosmetic retail stores, convenience stores, and department stores. (Table 1)

**Table 1:** Selected store for a market survey of hand cream products

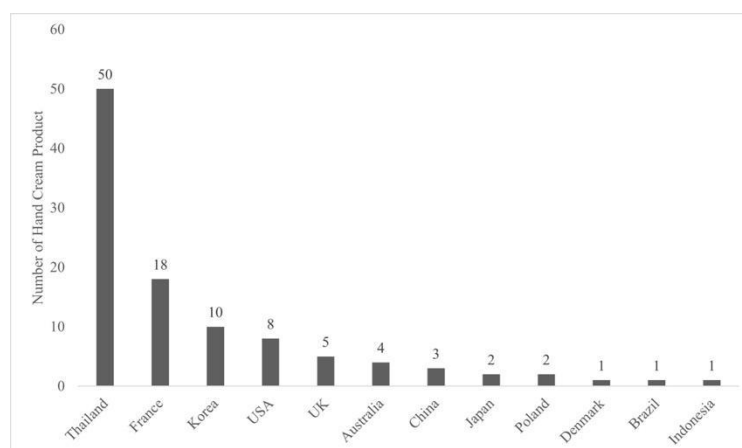
No.	Category of Store	Company Name	Store Name
1.	Cosmetic Retail Store	Central Watson Co., Ltd.	Watson
2.	Cosmetic Retail Store	Better Way (Thailand) Co., Ltd.	Mistine
3.	Cosmetic Retail Store	SSUP (Thailand) Co., Ltd.	Cute Press
4.	Cosmetic Retail Store	SSUP (Thailand) Co., Ltd.	Oriental Princess
5.	Cosmetic Retail Store	Eveandboy Co., Ltd.	Eve and Boy
6.	Cosmetic Retail Store	Karmarts Pub Co., Ltd.	Karmarts

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7.	Cosmetic Retail Store	Sephora (Thailand) Co., Ltd.	Sephora
8.	Cosmetic Retail Store	First Class Innovation Co., Ltd.	Dr.Pong
9.	Cosmetic Retail Store	Central and Matsumoto Kiyoshi Co., Ltd.	Matsumoto Kiyoshi
10.	Cosmetic Retail Store	Universe Beauty Co., Ltd.	Tellme
11.	Cosmetic Retail Store	Win Cosmetics Co., Ltd.	Win Cosmetics
12.	Convenient Store	CP All Pub Co., Ltd.	7 Eleven
13.	Convenient Store	CJ Express Group Co., Ltd.	CJ Express
14.	Convenient Store	Central Food Minimarket Co., Ltd.	Family Mart
15.	Convenient Store	Saha Lawson Co., Ltd.	Lawson
16.	Department Store	CP Extra Pub Co., Ltd.	Makro
17.	Department Store	Ek-Chai Distribution Co.,Ltd.	Lotus's
18.	Department Store	Big C Supercenter Pub Co., Ltd.	Big C
19.	Department Store	Xing Tai Trading Co., Ltd.	Miniso

A total of 105 hand cream products were collected from the above stores. Nearly fifty percent of the products were manufactured in Thailand, with France, Korea, and the USA being the next most common countries of origin. (Figure 1)



**Figure 1** Manufacturing country of hand cream products

The dataset comprised 105 hand cream products originating from 46 distinct companies and representing 50 different brands, as illustrated in Table 2.

**Table 2:** Company names with the number of products from each brand

Company Name	Brand	Number of Products(n=105)
Alpha-H	Alpha-H	1
Amore Pacific	Innisfree	1
Aveda	Aveda	1
Beiersdorf	Eucerin	1
	Nivea	1
Betterway	Mistine	9
C.A.R.E	HHOMS	1
Caudalie	Caudalie	1
Central Watson	Arome by Watson	3
	Garden of Love	2
	Watsons	15

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Company Name	Brand	Number of Products(n=105)
Cerave	Cerave	1
Common ground	Common Ground	1
Curel	Curel	1
Dee Q Olo Asset	PO Care	5
Dior	Dior	1
Dirty Works	Dirty Works	1
Faris by Naris	Faris	1
Fenty Beauty	Fenty Skin	1
First Class Innovation	Dr.PONG	1
Garnier	Garnier	1
Grown Alchemist	Grown Alchemist	2
HAAN	HAAN	3
Jill Stuart	Jill Stuart	2
Jmella	Jmella	5
Jo Malone	Jo Malone	3
K.M. Interlab	Cute Press	1
	Oriental Princess	2
Karmarts	Cathy Doll	2
Kayali	Kayali	1
Kyren	Kyren	1
L'Occitane	L'occitane	9
La Roche Posay	La Roche Posay	1
Melixir	Melixir	1
Minoso	Miniso	3
Ole Henriken	Ole Henriksen	1
Ouai	Ouai	2
Polka	Polka	2
Rare Beauty	Rare Beauty	1
Sabai Arom	Sabai Arom	1
Salt and Stone	Salt and Stone	2
Sephora	Sephora	1
Siam Yoko	Yoko	1
Sioris	Sioris	1
Smooth E	Smooth E	1
Sol De Janeiro	Sol De Janeiro	1
Supergoop	Supergoop!	1
This Work	This Works	2
Unilever	Vaseline	1
W.dressroom	W.dressroom	1

In the analysis of ingredients among a sample group of 105 products, Table 3 presents the top 10 ingredients found in hand cream products. Glycerine was the most prevalent ingredient, present in 71.43% of the products, followed by Fragrance at 68.57% and Phenoxyethanol at 64.76%.

**Table 3:** Top 10 ingredients in hand cream products

No	Ingredient	Number of Products (%) n = 105
1.	Glycerine	75 (71.43%)
2.	Fragrance	72 (68.57%)
3.	Phenoxyethanol	68 (64.76%)
4.	Cetearyl Alcohol	62 (59.05%)
5.	Butyrospermum Parkii butter	61 (58.10%)
6.	Glyceryl Stearate	59 (56.19%)
7.	Dimethicone	49 (46.67%)

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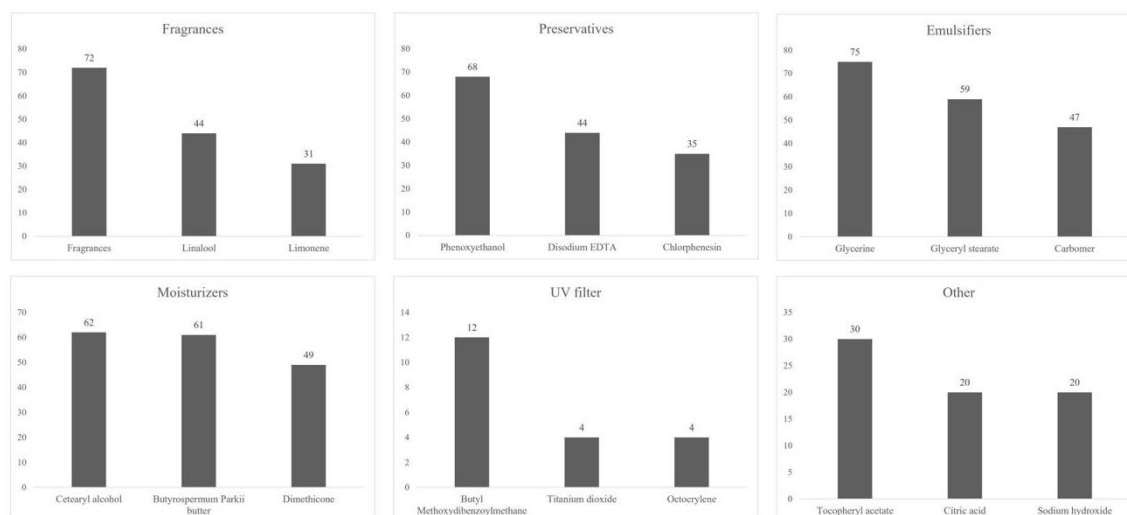


8.	Carbomer	47 (44.76%)
9.	Tocopherol	46 (43.81%)
10.	Disodium EDTA	44 (41.90%)

Moreover, a detailed analysis of ingredient frequency in hand cream products categorized them into six distinct groups: Fragrance, Preservative, Emulsifier, Emollient, UV Filter, and others. Figure 2 and Table 4 illustrate the top three ingredients in hand cream products from each category, based on a sample size of 105.

**Table 4:** Top 3 ingredients in hand cream products from each category

Ingredient	Number of Products (%) (n=105)
<b>Fragrance</b>	
1.Fragrance	72 (68.57%)
2.Linalool	44 (41.90%)
3.Limonene	31 (29.52%)
<b>Preservative</b>	
1.Phenoxyethanol	68 (64.76%)
2.Disodium EDTA	44 (41.90%)
3.Chlorphenesin	35 (33.33%)
<b>Emulsifiers</b>	
1.Glycerine	75 (71.43%)
2.Glyceryl Stearate	59 (56.19%)
3.Carbomer	47 (44.76%)
<b>Moisturizer</b>	
1.Cetearyl Alcohol	62 (59.05%)
2.Butyrospermum Parkii butter	61 (58.10%)
3.Dimethicone	49 (46.67%)
<b>UV Filter</b>	
1.Butyl Methoxydibenzoylmethane	12 (11.43%)
2.Titanium dioxide	4 (3.81%)
3.Octocrylene	4 (3.81%)
<b>Others</b>	
1.Tocopheryl acetate	30 (28.57%)
2.Citric acid	20 (19.05%)
3.Sodium hydroxide	20 (19.05%)



**Figure 2** Top 3 ingredients in each category of hand cream products

In the Fragrance category, the predominant ingredients were Fragrance itself, followed by Linalool and Limonene, representing 72 (68.57%), 44 (41.90%), and 31 (29.52%) of the products, respectively. In the Preservative category, Phenoxyethanol emerged as the primary ingredient, accompanied by Disodium EDTA and Chlorphenesin, constituting 68 (64.76%), 44 (41.90%), and 35 (33.33%) of the products, respectively. Glycerine dominated the Emulsifiers category, with Glyceryl Stearate and Carbomer following suit, comprising 75 (71.43%), 59 (56.19%), and 47 (44.76%) of the products, respectively. Moisturizers were chiefly comprised of Cetearyl alcohol, Butyrospermum Parkii butter, and Dimethicone, accounting for 62 (59.05%), 61 (58.10%), and 49 (46.67%) of the products, respectively. Notably, Butyl Methoxydibenzoylmethane ranked highest in the UV Filter category, trailed by Titanium dioxide and Tapioca starch, contributing to 12 (11.43%), 4 (3.81%), and 4 (3.81%) of the products, respectively. Furthermore, Tocopheryl acetate emerged as the most prevalent ingredient in the Others category, followed by Citric acid and Sodium hydroxide, comprising 30 (28.57%), 20 (19.05%), and 20 (19.05%) of the products, respectively, contributing to various skincare benefits. This comprehensive breakdown highlights the intricate balance between ingredients essential for efficacy and regulatory compliance within the aesthetic industry.

Among the 105 samples, 41 products have no fragrance, lanolin, and propylene glycol which are three common potential allergens in moisturizers.

The price of hand cream products ranged from 0.84 to 23.25 Baht per gram, with a mean of 7.32 Baht per gram.

#### 4.2 Discussion

Hand eczema is a prevalent inflammatory skin condition characterized by multifactorial causes, influenced by both extrinsic and intrinsic factors (Chai et al., 2023). Symptoms typically include highly pruritic skin lesions, often progressing into a chronic course characterized by skin thickening and painful fissures, significantly impacting quality of life. Management strategies for hand eczema entail the avoidance of known exacerbating factors alongside a range of options for topical and systemic treatments.

Hand cream emerges as the preferred choice for preventing and treating hand eczema due to its moisturization, thereby maintaining or enhancing the skin barrier to safeguard against dryness and chemical irritation (Ahmed et al., 2021). Moreover, hand cream is readily accessible for purchase. Nonetheless, it is essential to recognize that specific hand cream formulations may contain potential allergens capable of exacerbating symptoms or even precipitating the onset of hand eczema.



This study aimed to compile a comprehensive list of ingredients in hand cream products available in Thailand and investigate the prevalence of allergens in these products.

Although glycerine was found to be the most prevalent ingredient in hand cream in this study, glycerine was not identified as a common allergen in hand cream/moisturizer. Among the top 10 ingredients commonly found in hand cream formulations, fragrance, phenoxyethanol, and tocopherol were the three common allergens used for patch tests.

The previous study (Zirwas & Stechschulte, 2008) reported Fragrance, Paraben, Vitamin E, Essential oils, Benzyl alcohol, Propylene glycol, Formaldehyde, Iodopropynyl butylcarbamate, Lanolin, and Kathon CG as common allergens in moisturizers. Moreover, recent research (Silverberg et al., 2022; Silverberg et al., 2021; Suzuki et al., 2023) revealed Nickle, Quaternium-15, Fragrance, MI/MCI, Balsam of Peru, Carba mix, Thiuram mix, Cobalt, Formaldehyde, Propylene glycol, and Lanolin as common allergens associated with positive patch tests in individuals with hand eczema. Among those established data, fragrance, lanolin and propylene glycol were shared as common allergens. However, only fragrance was commonly found in our study. Lanolin and propylene glycol were presented only 0.95% and 20.00% of the products, respectively.

In our study, Fragrance and tocopherol consistently rank among the top three allergens, aligning with prior research. However, Phenoxyethanol, which was not previously identified in such studies, emerges as noteworthy here. This suggests a prevalent preference for certain scents and vitamin E among the Thai population, while lanolin and propylene glycol are infrequently encountered.

Moreover, it is noteworthy that a subset of the products surveyed did not contain the common allergens identified in previous studies, namely Fragrance, Lanolin, and Propylene glycol. These products accounted for 26 out of 105 samples, representing approximately 24.76% of the total.

These findings indicate that Thailand's current hand cream market exhibits variations in the prevalence of potential allergens compared to previous studies. For example, Phenoxyethanol, which was not listed as a common allergen in any of the four previous studies, emerged as the third most common allergen in hand creams in this survey. Thus, awareness of less common allergens should be emphasized, which could provide valuable insights for future studies aiming to determine the prevalence of currently common allergens. This heightened awareness would be beneficial for enhancing patient understanding and aiding in the selection of appropriate hand cream formulations for the prevention and treatment of hand eczema. However, it's imperative to acknowledge that this study encompassed a restricted selection of products obtained from a limited number of stores, concentrating solely on labeled hand cream formulations. It's worth noting that some individuals may opt for body cream or lotion for hand application, which was not accounted for in this investigation.

## 5. Conclusion

The findings of this study indicate that a significant majority of hand cream products in Thailand contain major allergens, namely Fragrance, Phenoxyethanol, and Tocopherol, accounting for 68.57%, 64.76%, and 43.81% of the products, respectively. Interestingly, Lanolin and Propylene glycol, which were common allergens identified in previous studies, were present in 0.95% and 20.00% of the products, respectively. According to this study, nearly 25% of Thailand's available hand cream products have no common potential allergens. Future research endeavors should aim to gather data on potential allergens present in body cream or lotion formulations, considering that some individuals may utilize these products for hand care purposes.

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