

Allergenic Ingredients in Personal Hygiene Wet Wipes

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Background: Wet wipes are a significant allergen source for anogenital allergic contact dermatitis.

Objective: The aim of the study was to calculate the frequency of potentially allergenic ingredients in personal hygiene wet wipes.

Methods: Ingredient lists from brand name and generic personal hygiene wet wipes from 4 large retailers were compiled.

Results: In the 54 personal hygiene wet wipes evaluated, a total of 132 ingredients were identified (average of 11.9 ingredients per wipe). The most common ingredients were *Aloe barbadensis* (77.8%), citric acid (77.8%), fragrance (72.2%), sorbic acid derivatives (63.0%), tocopherol derivatives (63.0%), glycerin (59.3%), phenoxyethanol (55.6%), disodium cocoamphodiacetate (53.7%), disodium ethylenediaminetetraacetic acid (EDTA) (42.6%), propylene glycol (42.6%), iodopropynyl butylcarbamate (40.7%), chamomile extracts (38.9%), sodium benzoate (35.2%), bronopol (22.2%), sodium citrate (22.2%), lanolin derivatives (20.4%), parabens (20.4%), polyethylene glycol derivatives (18.5%), disodium phosphate (16.7%), dimethylol dimethyl (DMDM) hydantoin (14.8%), and cocamidopropyl propylene glycol (PG)–dimonium chloride phosphate (11.1%). Of note, methylisothiazolinone (5.6%) was uncommon; methylchloroisothiazolinone was not identified in the personal hygiene wet wipes examined.

Conclusions: There are many potential allergens in personal hygiene wet wipes, especially fragrance and preservatives.

Bathe, wipe, douche—all are options for intimate hygiene, but in today's fast-paced society, convenient, quick cleansing is a valuable commodity. Personal hygiene wet wipes have met this need for many individuals, but at what price? The cost of a quick wipe can be measured in the burden of anogenital allergic contact dermatitis (ACD).

There are many reported cases of wet wipes associated with anogenital ACD,^{1–11} including at least 29 patients and affecting all ages from toddlers to seniors. In a recent retrospective analysis of 79 patients with wipe-associated contact allergy, anogenital dermatitis was significantly more common than in the general patch-test population.¹² The culprits in wipe-associated anogenital ACD are most likely adult personal hygiene wet wipes and baby wipes.

Although the composition of baby wipes has previously been evaluated,^{13,14} the prevalence of potential allergens in adult personal hygiene wipes is unknown. This study aimed to analyze potential allergens in personal hygiene wet wipes available at large retail stores in the United States.

METHODS

Ingredient Database

Data were obtained during May and June 2016. The list of personal hygiene wet wipes (brand name and generics), as well as their ingredients, was acquired from retail stores and Web pages. First, we searched Walgreens Pharmacy's Web page for "personal wipes," "intimate hygiene wipes," and "feminine wipes." Only those advertised for adult use were included; those marketed or identified as "baby/infant" wipes were excluded. Additional generic brand wipes were supplemented from CVS, Target, and Walmart. In cases where ingredient lists were not available online, package labels were examined in retail stores (Target, Walmart, Walgreens, CVS). If a personal hygiene wipe could not be found in stores, the list of ingredients was attained directly from the manufacturer. A personal hygiene wet wipe was excluded if the ingredient list could not be obtained by any of the aforementioned methods. Redundant wipes (those with the same ingredients and from the same manufacturer) were eliminated to minimize overrepresentation of any single brand's formulation due to changes in package

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advertising or quantity. Ingredients were compiled in Microsoft Excel (Excel 2010; Microsoft Corp, Redmond, WA).

Ingredient Analysis

To minimize redundant ingredient reporting, similar allergens were condensed into categories when appropriate. The International Nomenclature of Cosmetic Ingredients was used to combine synonymous ingredients into a single group. The Ingredient Database of the Personal Care Products Council was used to determine equivalent ingredients.¹⁵ In most cases, ingredients were not collapsed into broader categories (eg, fragrance materials, formaldehyde-releasing preservatives); however, “fragrance” and “parfum” were merged into 1 category, fragrance. Related allergens (eg, different species of chamomile or paraben variants) were compiled into the larger categories of “chamomile extracts” and “parabens.”

If multiple-related allergens were found within a personal hygiene wet wipe (eg, methyl paraben and propyl paraben), 1 wipe was reported; thus, frequencies represent the percentage of personal hygiene wet wipes containing any paraben and not the sum of parabens found in these wipes.

RESULTS

The final database consisted of 54 wipes specifically marked for intimate hygiene use. A total of 132 ingredients (before categorization) were identified, with an average of 11.9 ingredients per personal hygiene wet wipe.

Table 1 illustrates the most common ingredients. *Aloe barbadensis* and citric acid were most common, both identified in approximately three quarters (77.8%) of wipes. Fragrance (72.2%), sorbic acid derivatives (63.0%), tocopherol derivatives (63.0%), glycerin (59.3%), phenoxyethanol (55.6%), and disodium cocoamphodiacetate (53.7%) were identified in more than half of the personal hygiene wet wipes. The next most frequently observed ingredients included disodium ethylenediaminetetraacetic acid (EDTA) (42.6%), propylene glycol (PG) (42.6%), iodopropynyl butylcarbamate (40.7%), chamomile extracts (38.9%), and sodium benzoate (35.2%). Of note, methylisothiazolinone (MI) (5.6%) was uncommonly found and methylchloroisothiazolinone (MCI) was not identified in any of the personal hygiene wet wipes examined.

Table 2 summarizes the personal hygiene wipes that contain relatively few American Contact Dermatitis Society (ACDS) core allergens.¹⁶

DISCUSSION

Wipes are a significant allergen source of anogenital ACD.¹² This study further illustrates that many potential allergens are present in personal hygiene wet wipes and conveys the various allergen frequencies. The most common ingredients and likely potential allergens included fragrance, botanicals, preservatives, and PG.

TABLE 1. Ingredients Found in More Than 10% of Personal Hygiene Wipes

Ingredient*	Frequency in Personal Hygiene Wipes
	n (%)†
<i>A. barbadensis</i> (<i>A. vera</i>)	42 (77.8)
Citric acid	42 (77.8)
Fragrance	39 (72.2)
Sorbic acid derivatives‡	34 (63.0)
Tocopherol derivatives§	34 (63.0)
Glycerin	32 (59.3)
Phenoxyethanol	30 (55.6)
Disodium cocoamphodiacetate	29 (53.7)
Disodium EDTA	23 (42.6)
PG	23 (42.6)
Iodopropynyl butylcarbamate	22 (40.7)
Chamomile extracts	21 (38.9)
Sodium benzoate	19 (35.2)
Bronopol	12 (22.2)
Sodium citrate	12 (22.2)
Lanolin derivatives¶	11 (20.4)
Parabens#	11 (20.4)
Methyl paraben	11 (20.4)
Propyl paraben	9 (16.7)
Ethyl paraben	5 (9.3)
Butyl paraben	3 (5.6)
Isobutyl paraben	1 (1.9)
PEG derivatives**	10 (18.5)
Disodium phosphate	9 (16.7)
DMDM hydantoin	8 (14.8)
Cocamidopropyl PG–dimonium chloride phosphate	6 (11.1)

*Excludes water.

†Denominator for (%) is 54, total number of wipes analyzed.

‡Includes polysorbate 20, potassium sorbate, and sorbic acid. Excludes redundancies within a single wipe.

§Includes tocopherol and tocopheryl acetate. Excludes redundancies.

|| Includes *C. recutita* (chamomile and German chamomile). Excludes redundancies.

¶Includes PEG-75 lanolin and PPG-12-PEG-50 lanolin. Excludes redundancies.

#Excludes redundancies for multiple parabens present in a single wipe. A total of 29 parabens were found in the 54 wipes.

**Includes Bis-PEG/PPG-16/16 PEG/PPG-16/16 dimethicone, PEG-2 stearate, PEG-6 caprylic/capric glycerides, PEG-7 glyceryl cocoate, PEG-40 hydrogenated castor oil, PEG-50 shea butter, and PEG-7. Excludes redundancies.

Aloe Barbadensis

One of the most frequently identified ingredients, *A. barbadensis* (*Aloe vera*), was observed in 77.8% of the personal hygiene wet wipes. In a survey study of 400 general dermatology patients, aloe was the most commonly reported botanical used; 15.8% used an aloe-containing product.¹⁷ Current *A. vera* preparations seem to be well tolerated, with no sensitization detected in a multicenter investigation involving 702 patients by Reider et al.¹⁸ However, it is possible that patients may not be using *A. vera* as often as they think, with a recent news article exposing that many aloe products sold at large retailers are devoid of any aloe content.¹⁹ Reports of

TABLE 2. Personal Hygiene Wipes With Relatively Few ACDS Core Allergens

Wipe	Ingredients
Equate Everyday Clean Fragrance Free Wipes*	Water, cocamidopropyl PG–dimonium chloride phosphate, glycerin, phenoxyethanol, iodopropynyl butylcarbamate, <i>C. recutita</i> (matricaria) flower extract, <i>A. barbadensis</i> leaf extract, tocopheryl acetate, citric acid
Lady Groomer Woman Wipes, Flushable Moist Feminine Wipes, Fresh Scent*	Water, <i>A. barbadensis</i> leaf juice, glycerin, polysorbate 20, sodium benzoate, disodium cocoamphodiacetate, potassium sorbate, tocopheryl acetate, sodium citrate, citric acid, fragrance
Pjur Med Clean Personal Soft Cleaning Fleece	Water, phenoxyethanol, cocamidopropyl betaine, chlorhexidine digluconate, PEG-7, glycerol, cocoate, dimethicone copolyol, neohesperidine dihydrochalcone, sorbitol
Pure Touch Individual Flushable Moist Feminine Wipes*	Deionized water, sodium laureth sulfate, glycerin, cocamidopropyl betaine, cocamide MEA, disodium cocoamphodiacetate, polysorbate 20, <i>A. vera</i> (<i>A. barbadensis</i>), tocopherol, allantoin (Comfrey root), retinyl acetate, methyl paraben, propyl paraben, stearic acid, triclosan, citric acid
Summer's Eve Cleansing Cloths for Sensitive Skin, Sheer Floral*	Water (purified), octoxynol 9, citric acid, sodium benzoate, tocopheryl acetate, <i>A. vera</i> (<i>A. barbadensis</i>) leaf juice, neutresse, disodium EDTA, fragrance, sodium sulfite, ascorbic acid, potassium sorbate
Swipes Lovin Wipes All Natural Flushable Intimate Towelettes, Cucumber*	Water (purified), <i>A. vera</i> (<i>A. barbadensis</i>) leaf juice, glycerin, polysorbate 20, sodium benzoate, disodium cocamphodiacetate, potassium sorbate, tocopheryl acetate, sodium citrate, citric acid, fragrance
Swipes Lovin Wipes All Natural Flushable Intimate Towelettes, Unscented*	Water (purified), <i>A. vera</i> (<i>A. barbadensis</i>) leaf juice, glycerin, polysorbate 20, sodium benzoate, disodium cocamphodiacetate, potassium sorbate, tocopheryl acetate, sodium citrate, citric acid
Up&Up Extra Large Cleansing Washcloths with Chamomille*	Water, <i>C. recutita</i> (matricaria) flower extract, disodium cocoamphodiacetate, polysorbate 20, citric acid, disodium phosphate, disodium EDTA, ethylene brassylate, phenoxyethanol, sodium benzoate

Components of fragrance mixes identified in wipes (cital) were condensed with fragrance and parfum and counted as 1 ACDS allergen.

*Denotes wipe containing fragrance or botanical extracts.

MEA indicates monoethanolamine.

ACD from *A. barbadensis* are very rare.²⁰ Considering the prevalence of *A. vera* in personal hygiene and other types of wipes,¹³ without any report of hypersensitivity from a wipe, *A. barbadensis* seems to be an improbable allergen in personal hygiene wipe-associated ACD.

Fragrance/Parfum

In North American epidemiologic patch-test studies, positive reactions to fragrance mix I are common.^{21–27} Fragrance/parfum was observed in 72.2% of the personal hygiene wet wipes in our study, making it the third most common ingredient in these wipes—even without adding other ingredients that serve as fragrances (eg, chamomile, lavender) to this group. As a result, the frequency of fragrance-related ingredients (such as botanicals and individual fragrance chemicals) in personal hygiene wet wipes is much greater than reported herein.

Multiple reports of ACD from fragrance correlated with wipe use have been published,^{8,10,28,29} especially in relation to personal hygiene and baby wipes. In a recent study of ACD from allergens in wipe sources (personal hygiene vs other wipe types not specified), 9 reactions (12.3%) were caused by fragrance (or related) allergens included in the North American Contact Dermatitis Group screening series.¹² The high prevalence of fragrance/parfum in the

personal hygiene wet wipes reported in this study underscores that these wipes are a potential source of fragrance-related ACD.

Tocopherol Derivatives

Tocopherol (or derivative) was identified in close to two thirds (63.0%) of the personal hygiene wet wipes. It serves as a moisturizer, as well as an antioxidant and antiaging agent.³⁰ Allergic reactions to tocopherol are relatively rare (0.6% of 4859 patch-tested patients)²¹ but have been documented related to a tocopherol-containing wipe.¹²

Phenoxyethanol

Phenoxyethanol was the seventh most common ingredient identified in the personal hygiene wet wipes. Few reports of ACD from phenoxyethanol exist,^{31–33} and it is generally thought to be a rare sensitizer.³⁴ Traditionally, phenoxyethanol is patch tested with methyl dibromoglutaronitrile because these preservatives have often been used in combination in consumer products. The European Union recently banned methyl dibromoglutaronitrile secondary to its high sensitization rate.³⁵ Consequently, methyl dibromoglutaronitrile is also uncommonly identified in North American products. None of the 54 personal hygiene wipes examined in our study contained methyl dibromoglutaronitrile.

Propylene Glycol

As a colorless vehicle and emulsifier, PG is used in a wide range of products. Its functions range from the base of topical corticosteroids to a vaporizer in electronic cigarettes.³⁶ In the 2013–2014 North American Contact Dermatitis Group report, the reaction rate to PG was 2.8%.²¹ Allergic contact dermatitis from PG identified in a wipe source has yet to be reported.

Iodopropynyl Butylcarbamate

Iodopropynyl butylcarbamate is a particularly problematic allergen in wipes. In a recent analysis of 79 cases of ACD associated with wipe sources, 12.3% of the cases were from this preservative.¹² This reaction rate is more than 2.5 times higher than that of the general patch-test population (4.7%).²¹ Multiple cases of wipe-associated ACD due to iodopropynyl butylcarbamate-containing wipes have been reported^{8,9,28}; one involved perianal dermatitis caused by a moist sanitary wipe.⁹ Most iodopropynyl butylcarbamate reactions are correlated with personal care products,³⁷ and the frequency of this preservative in personal hygiene wet wipes (40.7%) makes it a pertinent allergen. Iodopropynyl butylcarbamate may also cause irritant patch-test reactions, so judicious interpretation of test sites is important.³⁷

Chamomile Extracts

Chamomile extracts (including *Chamomilla recutita*, “chamomile,” and “German chamomile”) were identified in 38.9% of the personal hygiene wet wipes. Chamomile has many uses from herbal tea and wound healing³⁸ to treating atopic dermatitis.³⁹ Sensitization to chamomile (included in the *Compositae* mix) and related allergens such as sesquiterpene lactone mix and parthenolide is low (1.7%, 0.9%, 0.8%, respectively).²¹ Compared with other *Compositae* species, initial sensitization from chamomile is less common⁴⁰; however, the prevalence of these extracts in personal hygiene wet wipes could sustain dermatitis in those sensitized from other related allergens.

Formaldehyde-Releasing Preservatives

Of the formaldehyde-releasing preservatives, bronopol (2-bromo-2-nitropropane-1,3-diol) was most frequently found in the personal hygiene wet wipes (22.2%). In a recent investigation of ACD from wipe sources, bronopol was runner up only to the isothiazolinones in allergic reactions associated with wet wipe sources.¹² Sensitization to bronopol in the general patch-test population is 2.1%,²¹ but among those with wipe allergy, bronopol is responsible for 27.4% of the positive patch-test reactions¹²—a more than 10-fold increase. Less commonly used compared with other formaldehyde-releasing preservatives, bronopol can be found in 0.5% of cosmetics and toiletries⁴¹ but is much more frequently found in personal hygiene wipes.

Dimethylol dimethyl (DMDM) hydantoin was found in 14.8% of personal hygiene wet wipes. “Formaldehyde” was not listed on any of the 54 personal hygiene wipe labels. The connection between DMDM hydantoin and formaldehyde allergy has been investigated by Rietschel et al⁴² who found that of those with DMDM hydantoin allergy, 83.4% were also allergic to formaldehyde.⁴² Conversely, of those with formaldehyde allergy, 19.4% were also allergic to DMDM hydantoin.⁴² Diazolidinyl urea, another formaldehyde releaser, was infrequently identified in personal hygiene wet wipes (5.6%). Quaternium-15 and imidazolidinyl urea were not identified in our personal hygiene wipe sample.

Lanolin Derivatives

Modified from the secretions of sheep sebaceous glands, lanolin derivatives have variable composition owing to differing sheep breeds, methods of lanolin extraction and purification,⁴³ and ultimately chemical conjugations and variations applied. The lanolin derivatives found in the personal hygiene wet wipes were modified with polyethylene glycol (PEG) and polypropylene glycol. Risk factors for developing ACD from lanolin include chronic dermatitis, especially stasis dermatitis involving the lower extremities.⁴³ Among those with wipe-associated allergy patch tested in



Figure 1. Personal hygiene wipe–related clinical photographs. A, Patient’s personal hygiene wet wipe, containing MI. B, Mild (1+) reaction to personal hygiene wipe on patch test day 5. C, Mild (1+) reaction to MCI/MI on day 5. D, Strong (3+) reaction to MI on day 5.

North America, none were associated with positive reactions to lanolin.¹²

Parabens

Parabens are popular and convenient preservatives because of their low cost, high compatibility, and wide spectrum of antimicrobial activity.⁴⁴ As one of the least sensitizing preservatives, parabens are among the safest antimicrobial classes from an allergy perspective. Unfortunately, associations between parabens, hormonal dysregulation,^{45,46} and breast cancer⁴⁷ stemming from laboratory animal studies have resulted in avoidance by the general public. In our study, 20.4% of the personal hygiene wet wipes contained at least 1 paraben, most frequently methyl paraben or propyl paraben.

Menné and Hjorth⁴⁸ reported cross-reactivity between parabens, noting that most of those with paraben sensitivity also reacted to at least one other paraben variant. Propyl paraben exhibited particularly high cross-reactivity, with all those sensitized also reacting to butyl paraben, ethyl paraben, or both.⁴⁸ Butyl paraben has been the most frequently positive in patch-test studies⁴⁸ but was found much less frequently in personal hygiene wet wipes (5.6%) than methyl paraben (20.4%) or propyl paraben (16.7%). Sensitivity to parabens is relatively uncommon (0.6%).²¹

Methylisothiazolinone and Methylchloroisothiazolinone

Methylisothiazolinone and MCI have been repeatedly implicated as causal allergens in anogenital ACD associated with wet wipe sources.^{1–8,10,11} Most of these reports involved baby wipes and personal hygiene wet wipes (referred to as “moist toilet paper” in Europe) as shown in Figure 1.

Not only do MI and MCI take the blame most often in independent reports, but also these isothiazolinones were the most frequently responsible allergens in a multicenter retrospective study of 79 patients with wipe-associated contact allergy.¹² Interestingly, the high reporting of contact allergy to isothiazolinones in personal hygiene wet wipes is not matched by their prevalence, MI (5.6%) and MCI (not identified). This could be a sign that manufacturers are removing isothiazolinones from their formulations. Regardless, it bodes well for wipe users that MCI and MI are not commonly found in personal hygiene wipes.

Limitations

This study has several limitations. First, the personal hygiene wet wipes in this data set included only those specifically marketed for intimate hygiene use and did not integrate any other types of wipe that could be used in the anogenital area (eg, baby wipe). Second, we analyzed personal hygiene wet wipes available at large retailers; specialty personal hygiene wet wipes, those from smaller companies, and those unavailable on the Web or in Minneapolis retail stores were not incorporated into our analysis. Finally, manufacturers may modify product formulations at any time; thus, the ingredients mentioned in this study may change in the future.

CONCLUSIONS

Anogenital dermatitis is common among patients with ACD from wipe sources. The most likely potential allergens found in personal hygiene wet wipes included botanicals, fragrance, preservatives, and PG. *Aloe barbadensis* and citric acid were the most common ingredients, identified in 77.8% of personal hygiene wet wipes. Fragrance was also commonly found, present in 72.2% of these wipes. With well more than a hundred ingredients found in personal hygiene wipes, many potential allergens are important to consider in the evaluation of patients with wipe-associated ACD.

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