ARQUIVOS DE ASMA, ALERGIA E IMUNOLOGIA

Review Article

Contact dermatitis to alkyl glycosides: are we aware of its importance?

Dermatite de contato aos alquil glicosídeos: estamos cientes da importância?

Paulo Eduardo Silva Belluco[1], Carolina Tavares De-Alcântara[2], Jullia Eduarda Feijó Belluco[3], Maurício Domingues Ferreira[4], Rosana Zabulon Feijó Belluco[1], Fabíola da Silva Maciel Azevedo[5]

ABSTRACT

Alkyl glycosides are nonionic surfactants derived from fatty alcohols and glucose. They are widely used in personal care products such as shampoos, sunscreens, and moisturizers due to their mild and biodegradable properties. Important cases of allergic contact dermatitis to substances from this family have been reported. The PubMed, SciELO, and LILACS databases were searched for articles on contact dermatitis to alkyl glycosides published in the last 10 years, in English or Portuguese, involving human participants. Contact dermatitis to alkyl glycosides is a significant and emerging condition due to the widespread use of these surfactants. Its prevalence is relatively high but often underestimated due to the lack of inclusion of elements of this family in many baseline series. However, decyl glucoside has already been included in the American series and was recently included in the European baseline series. In view of this, we highlight the need to include alkyl glycosides in the Brazilian baseline and cosmetic series to prevent this contact allergy from remaining underdiagnosed. This would allow for the adequate diagnosis of suspected cases and development of more effective prevention strategies, such as innovations in the formulation of alternative products.

Keywords: Allergic contact dermatitis, glycosides, surface-active agents, cosmetics.

RESUMO

Os alquil glicosídeos são surfactantes não iônicos derivados de álcoois graxos e glicose. São amplamente utilizados em produtos de higiene pessoal, como xampus, filtros solares e hidratantes, devido às suas propriedades suaves e biodegradáveis. Importantes casos de dermatite de contato alérgica a substâncias desta família têm sido relatados. As fontes da pesquisa incluíram artigos científicos publicados nas bases de dados PubMed, SciELO e LILACS. Os critérios de seleção dos artigos incluídos abordam a dermatite de contato relacionada aos alquil glicosídeos, publicados nos últimos 10 anos, em inglês e português, e com seres humanos como sujeitos de estudo. A dermatite de contato aos alquil glicosídeos é uma condição significativa e emergente, devido ao uso disseminado desses surfactantes. Sua prevalência é relativamente alta, mas muitas vezes subestimada devido à ausência de inclusão de elementos desta família em muitas baterias padrões. No entanto, decil glicosídeo já havia sido incluído em série americana e foi recentemente incluído na série base europeia. Diante disso, destacamos a necessidade de incluir os alquil glicosídeos em série base nacional e em série de cosméticos, para não deixarmos oculta esta alergia de contato. Desta forma, poderíamos diagnosticar adequadamente os casos suspeitos, e com isso desenvolver estratégias de prevenção mais eficazes, como a inovação na formulação de produtos alternativos.

Descritores: Dermatite alérgica de contato, glicosídeos, tensoativos, cosméticos.

1. Escola Superior de Ciências da Saúde - ESCS - Brasília, DF, Brazil.
2. Centro Universitário do Pará - CESUPA - Belém, PA, Brazil.
3. Centro Universitário UNIEURO - Brasília, DF, Brazil.
4. Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo - São Paulo, SP, Brazil.
5. Hospital de Força Aérea de Brasília - Brasília, DF, Brazil.

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Introduction

Surfactants are substances that reduce the surface tension between two liquids or between a liquid and a solid. They can act as detergents, emulsifiers, or foaming agents.[1] Alkyl glucosides are a type of nonionic biodegradable surfactant commonly used in cleaning products. They are made by reacting glucose with a long-chain fatty alcohol, usually derived from coconut or palm oil.[2] Recently, some cases of contact dermatitis caused by glucosides have been reported. The most common ones associated with allergic reactions are decyl glucoside and lauryl glucoside.[3] These are found in rinse-off products such as shampoos, soaps, and hair dyes. However, they are also used in leave-on products such as sunscreens, moisturizers, and deodorants. They can even be found in baby wipes and therefore are widely used by the population.

Although considered less irritating than other surfactants such as sodium lauryl sulfate, glucosides are believed to cause a relatively high incidence of allergic contact dermatitis.[1] On the other hand, this rate may actually be underestimated because there are few large studies on the topic and many baseline series do not include these substances.[2]

Reports of contact eczema caused by this group of allergens have become more common, leading the American Contact Dermatitis Society (ACDS) to name them allergen of the year in 2017.[3] Indeed, decyl glucoside had already been added to the North American Contact Dermatitis Group (NACDG) baseline series back in 2009. In 2022, the European Society of Contact Dermatitis (ESCD) also recommended adding decyl glucoside to its baseline series.[4] In Brazil, however, this group of allergens is rarely discussed, and no alkyl glucosides are currently included in baseline series. This review aims to highlight the importance of these substances in allergic contact dermatitis and to show why they should be routinely included in baseline series.

Methods

This is a narrative literature review conducted between April and May 2024. Three electronic databases were used to select the articles: PubMed, Scientific Electronic Library Online (SciELO), and Latin American and Caribbean Health Sciences Literature (LILACS). For the article selection process, Health Sciences Descriptors (DeCS) and Medical Subject Headings (MeSH) were used, with the keywords *alkyl glucosides* and *contact dermatitis* combined using the Boolean operator *and*.

To ensure the literature selected was appropriate for this review, the following inclusion criteria were applied: studies involving humans, articles published within the last 10 years, and articles written in English or Portuguese. Scientific publications that were not closely related to the topic — based on title and abstract screening — were excluded.

Results

A total of 43 articles related to the topic were identified, of which 19 were duplicates. After reviewing the abstracts of the remaining 24 studies, 4 were excluded. As a result, 20 articles were included in this review. No publications in Portuguese were found, highlighting the importance of this review. The article selection process is shown in Figure 1.

Discussion

Alkyl glucosides are a group of 19 surfactants derived from renewable sources. They are used in both rinse-off products (eg, cleaning agents) and leave-on products (eg, cosmetics). Currently, decyl glucoside is the most widely used. However, cetearyl, lauryl, and coco glucosides are also commonly used.[5]

They are considered safe for use[5] and are commonly found in products labeled as "hypoallergenic" or safe for sensitive skin.[4] However, alkyl glucosides in sunscreens, cosmetics, and cleaning products can cause sensitization through a mechanism that is still unclear. When tested, most patients react to multiple alkyl glucosides.[5] Women are more commonly affected, which may be due to their higher use of cosmetics.[4] Most cases are not work-related. However, allergic reactions can occur in occupational settings, especially among health professionals, cleaners, and salon professionals.[5] Conditions such as atopic dermatitis can increase glucoside penetration due to a impaired skin barrier.[2] Individuals with atopic dermatitis may be at greater risk of developing allergic contact dermatitis to weaker allergens, such as those in this group.[6]

The clinical presentation varies depending on the areas of product application.[2] The hands, face, and neck are commonly affected by exposure to shampoos, sunscreens, and liquid soaps. Nonexposed

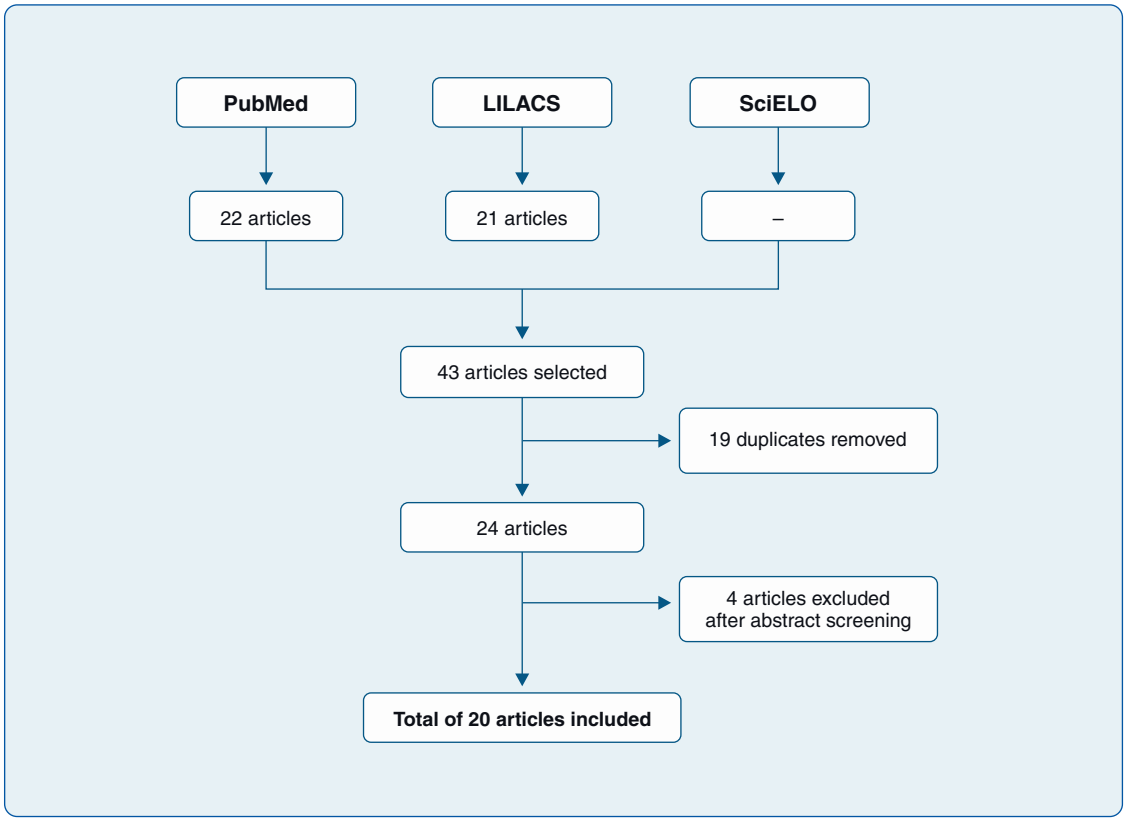

Figure 1
Flowchart of the article selection process

areas such as the breasts, abdomen, and genitals can be affected by antiseptics, skin cleansers, and baby wipes.[5] In occupational exposure, eczema most often affects the hands — such as in hairdressers handling hair products or nurses applying creams and antiseptics.[2]

In most cases, strict avoidance of the products involved and treatment with topical corticosteroids lead to the resolution of dermatitis.[5] Because of likely significant cross-reactivity, the safest approach is to avoid all alkyl glucosides.[7]

Rinse-off products

Shampoos are the most common cause of contact dermatitis from alkyl glucosides.[5] Hair care products are the most frequent source of such allergens.[7] They usually contain a mix of different glucosides, and their exact composition is not always clear. Since shampoos and cosmetics also contain preservatives, fragrances, and other allergens, testing both the patients' products and the individual ingredients is important.[5] An interesting study analyzing the ingredients of shampoos marketed as "hypoallergenic" or "for sensitive skin" found that 56.7% of these shampoos contained alkyl glucosides, of which coco glucoside was the most common.[8]

Sunscreens

Until recently, decyl glucoside was considered a "hidden" allergen in sunscreens containing Tinosorb® M because, while used during manufacturing, it was not listed as an ingredient.[7] It is now known that this widely used sunscreen contains the active ingredient bisoctrizole, along with propylene glycol, xanthan gum,

and decyl glucoside.[9] One case involved a woman who developed itchy eczema on her face, especially around the eyelids, after using different cosmetics. Patch testing was positive for decyl glucoside, Tinosorb® M (which contains decyl glucoside), and her facial cream (which also contained Tinosorb® M). This case highlights the importance of checking for hidden allergens in facial creams, since most of them contain UV filters. On the other hand, previous sensitization to alkyl glucosides through cosmetics may increase the likelihood of an allergic reaction to the decyl glucoside present in Tinosorb® M.[9]

Other personal care products

The general population is increasingly seeking products labeled as "natural," "hypoallergenic," or "clean," under the assumption that these items are typically free from harmful ingredients. A study assessing the prevalence of allergenic ingredients in such personal care products (Table 1) reported that alkyl glucosides were the sixth most commonly found allergen, present in 20.7% of the total consumer items.[10] In another study that evaluated the prevalence of surfactants in products listed in the American Contact Dermatitis Society Contact Allergen Management Program (CAMP), glucosides were found in 10% of the products analyzed.[11] Thus, they represented the third most common surfactant group and were the most frequently found in household-use substances.[11]

An interesting study analyzed the composition of facial moisturizers marketed for men. It found that 26.2% of these products contained alkyl glucosides, with cetearyl glucoside being the most frequently identified.[12]

There are case reports highlighting specific glucosides, such as one involving a woman who applied an anti-wrinkle facial cream only once. She developed acute dermatitis affecting her face and neck. Patch testing confirmed an allergy to arachidyl glucoside, an ingredient in the product that has rarely been reported as a cause of allergy. In that case, the patient also had positive reactions to other glucosides that were not present in the cream she used.[13]

Medications and hospital-use products

A survey was conducted to identify common allergens in surgical disinfectants (products used by health professionals for scrubbing and surgical asepsis). Among the 267 products analyzed, alkyl glucosides were found in 6% of them. However, just as the use of glucosides in personal care products has increased, their presence in soaps and cleaning products used in surgical settings may also become more common.[14]

In two case reports, contact dermatitis was linked to the same topical medication (Ialuset cream®). The only confirmed sensitivities were to the undiluted product and to 5% cetearyl glucoside, a component of the cream. In these cases, no sensitivity to other tested glucosides was observed.[15]

Another case involved a 70-year-old patient with a chronic ulcer on her ankle that had persisted for 6 months. She was initially treated with foam dressing without success. Due to marked erythema and exudation, a local infection was suspected. The dressing was then replaced with another foam dressing containing an antiseptic (polyhexanide). However, her condition did not improve. Allergic eczema was then considered, and patch testing was performed. The test was positive for the dressing material and borderline positive for lauryl glucoside, but negative for the antiseptic. The exact composition of the dressing was not disclosed by the manufacturers. However, chemical analysis of the product confirmed the presence of the glucoside in

Table 1
Prevalence of alkyl glucosides in so-called "natural" products

Product category	Alkyl glycosides[a]
All "natural" products	20.7%
Soap	43.0%
Shampoo	40.3%
Conditioner	4.2%
Deodorant	0.0%
Sunscreen	24.8%
Moisturizer	13.4%
Hair treatment	3.1%
Toothpaste	0.0%

[a] Includes lauryl, coco, decyl, and other related glucosides.
Adapted from Tran et al.[10]

the foam, supporting the relevance of the borderline test result.[16]

In the United States

A large study by the NACDG, involving 24,000 patients evaluated over a 10-year period, compared glucoside-positive vs glucoside-negative patients and showed that sensitized individuals had significantly higher rates of occupational skin disease, atopic dermatitis, and/or asthma. More than 80% of the reactions to glucosides were considered to have current clinical relevance.[7] In the most recent NACDG survey, decyl glucoside showed a positivity rate of 2.1%, confirming the need for its inclusion in baseline series. Lauryl and coco glucosides both had a positivity rate of 1.4%, while cetearyl glucoside had a lower rate of only 0.4%.[17]

In Europe

An evaluation of the inclusion of glucosides in the European baseline series found a positivity rate of 1.73% for decyl glucoside, supporting its inclusion in that series. On the other hand, the positivity rate for lauryl glucoside was only 0.3%, suggesting that it may be more appropriately placed in the cosmetics series.[18]

A recent study by a Spanish group tested alkyl glucosides (decyl and lauryl glucosides) in 3,629 patients. They found a positivity rate of 0.8%. The mean age of positive patients was 55.5 years and most of them were women (56.7%). Presumably, 26.7% of the positive cases had atopic dermatitis. Among sensitized individuals, the most affected body areas were the hands and the face. The products most commonly involved were leave-on products.[4]

In Brazil

There are no alkyl glucosides included in the Brazilian baseline series or in the Latin American baseline series. Similarly, glucosides are not present in the cosmetics series. Only decyl and lauryl glucosides are found in the hair product series, which is still rarely used in Brazil. This may explain the absence of reported cases of sensitivity to this group of surfactants in the country.

Patch testing and possible screening for glucosides

The NACDG and the ESCD test decyl glucoside at 5% in petrolatum as the vehicle, while lauryl glucoside is tested by both organizations at 3% in petrolatum.[17,18] Columbia University published a study showing that 13% of individuals who reacted to lauryl glucoside did not react to decyl glucoside. Likewise, 23% of those who reacted to decyl glucoside did not react to lauryl glucoside. Based on these findings, the study concluded that no single glucoside could serve as a screening agent for allergy to another glucoside. Since these reactions are usually clinically relevant, specialists are advised to test for all possible alkyl glucosides when there is suspicion of cosmetic allergy.[19]

Cross-reactivity

Most patients tested for different glucosides show multiple positive reactions, likely due to their structural similarity.[2] This suggests that sensitization may represent a group allergy with possible cross-reactivity. However, industrial production processes are known to produce impurities resulting in mixtures of different glucosides.[2,5] As a result, positive patch test reactions to different glucosides may actually reflect simultaneous exposure rather than true cross-reactivity.[5] A British study evaluating five specific glucosides found that 79.3% of patients reacted to more than one alkyl glucoside. However, the authors noted that these simultaneous reactions did not occur consistently, and therefore recommended testing multiple members of this chemical family.[20]

In a series of 30 cases that reacted to glucosides, 25 patients also showed reactions to unrelated chemical substances, with many of them presenting multiple sensitivities. An increased risk of polysensitization may be explained by genetic predisposition, frequent and/or prolonged exposure, or acquired susceptibility resulting from skin barrier disruption.[21]

Conclusions

Glucosides are important and emerging allergens. They are widely present in popular household products. Many clinical cases of allergic contact dermatitis still show no positive results in patch testing. Therefore, the possibility of a glucoside allergy should be considered. To improve diagnosis, these substances need to be included in the national baseline series and in the cosmetics series. Only then will it be possible to take a step forward in accurately diagnosing these patients.

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Corresponding author:
Paulo Eduardo Silva Belluco
E-mail: belluco@outlook.com