

CONTACT POINT

Alkyl glucosides: Newly identified allergens in foam wound dressings

Stefan Kerre¹  | Tine Strobbe² | Tania Naessens³ | Mart Theunis³ | Kenn Foubert³ | Olivier Aerts⁴ 

¹Dermatologieaarschot.be, Aarschot, Belgium

²Imelda ziekenhuis, Department Dermatology, Bonheiden, Belgium

³Research Group Natural Products and Food—Research and Analysis (NatuRA), Department of Pharmaceutical Sciences, University of Antwerp (UA), Antwerp, Belgium

⁴Department of Dermatology, University Hospital Antwerp (UZA) and University of Antwerp (UA), Antwerp, Belgium

Correspondence

Dr Stefan Kerre, Gijmelsesteenweg 14A, B-3200 Aarschot, Belgium.

Email: dermatologieaarschot@gmail.com

KEYWORDS: allergic contact dermatitis, CAS no. 110615-47-9, case report, chemical analysis, decyl glucoside, foam dressing, glucosides, isobornyl acrylate, lauryl glucoside, wounds

Alkyl glucosides are low-risk allergens that are used as non-ionic, mild surfactants in rinse-off and leave-on cosmetics, antiseptics, hair dyes, and food.¹ Recently, glucoside-containing foam dressings, which are used in the treatment of leg ulcers, have also been reported as a cause of allergic contact dermatitis.^{2,3} We here report a third case of allergic contact dermatitis caused by a foam wound dressing in which the presence of lauryl glucoside (CAS no. 110615-47-9) could be confirmed and quantified by chemical analysis.

CASE REPORT

A 70-year-old female had suffered from an ulcer on her left ankle for 6 months; she had treated it with topical antiseptics and a hydrophilic foam dressing (Kendall; Covidien, Dublin, Ireland), without any success. Because oozing and redness of the perilesional skin had developed, bacterial colonization or superinfection was suspected, and the dressing was replaced with Kendall AMD antimicrobial dressing, which contains a topical antiseptic, namely, polyhexamethylene biguanide (PHMB). This, however, did not improve her condition.

Because allergic contact dermatitis was subsequently suspected, patch tests with the Belgian baseline series and a cosmetic series (Chemotechnique, Vellinge, Sweden), and with the patients' own products, were performed by S.K. Both types of foam dressing were patch tested "as is". IQ Ultra patch test chambers (Chemotechnique) were used; they were fixed with Fixomull stretch (BSN medical, Hamburg, Germany) for 2 days, and read according to ESCD

guidelines⁴ after 2 and 4 days. The tests resulted in a ?+ reaction to lauryl glucoside, and + reactions to both Kendall foam dressings, on day (D) 2, all evolving into ++ reactions on D4. No later reactions were reported. An additional patch test with PHMB 5% aq. (provided by O. Aerts) remained negative. Decyl glucoside could not be patch tested.

According to the literature,^{2,3} and as acknowledged by the manufacturer, Kendall foam dressings contain "Glucopon 625," which is a mixture of glucosides with chain lengths from C₁₀ to C₁₆. To further substantiate the relevance of the positive patch test reaction to lauryl glucoside, a C₁₈ molecule, we performed chemical investigations to verify its presence in the foam dressing, and in the commercially available patch test materials of lauryl glucoside 3% pet. (from S.K.) and decyl glucoside 5% pet. (from the Antwerp department). Because 1 publication suggested that isobornyl acrylate (IBOA) might be an impurity and a potential true allergen in products containing alkyl glucosides,⁵ the analyses were complemented with a search for the presence of IBOA in the foam dressings and in the patch test materials. Briefly, for the foam dressing, 100 µL of a standard solution of lauryl glycoside (1 mg/mL) (Sigma, Saint Louis, Missouri) and IBOA (Loctite, Henkel, Düsseldorf, Germany) were dried under N₂, and subsequently redissolved in 150 µL of BSTFA: N,O-Bis(trimethylsilyl)trifluoroacetamide + 1% MCTS Trimethylchlorosilane/pyridine (2:1). The derivatization reaction was performed at 70°C for 1 hour. The foam dressing was first cut into pieces, and patch test material was then stirred with methanol for 1 hour. The solution was filtered and dried under reduced pressure. The residue was derivatized

according to the standard. Samples were injected (1 μ L) on a Voyager gas chromatograph (GC)-mass spectrometer (MS) with a Trace 2000 GC (Thermo Finnigan San Jose, California) and a Alltech Heliflex AT-wax capillary column with a length of 60 m, internal diameter of 0.25 mm, and film thickness of 0.25 μ m (Alltech, Nicholasville, Kentucky). The carrier gas was He, used at a constant flow rate of 1 mL/min; the injector and MS source temperature were maintained at 250°C and 200°C, respectively. The temperature program was as follows: start at 200°C; hold at 200°C for 10 minutes; increase the temperature at a rate of 3°C/min until it reaches 230°C; and hold at 230°C for 20 minutes. The MS was operated in the electron impact mode with an ionization energy of 70 eV. Chromatograms were recorded with full scan (range: 29–1020 u [Da]), and every sample was analysed with a split ratio of 20. All data were recorded and processed with XCALIBUR software, version 1.0 (Thermo Fisher Waltham, Massachusetts).

Semiquantitative analysis with GC-MS showed the presence of 1.5 ppm lauryl glucoside in the foam. Additionally, similar chemical analyses of pet.-based patch test preparations of lauryl glucoside 3% and decyl glucoside 5% showed that both samples contained lauryl glucoside. IBOA could not be detected in the foam dressing, or in the patch test materials containing lauryl glucoside and decyl glucoside.

DISCUSSION

Allergic contact dermatitis caused by wound dressings has been previously reported, and propylene glycol and modified colophonium have been highlighted as the main contact allergens; more rarely, silver, acrylates and carboxymethylcellulose have been involved.^{6–11} However, as the exact composition of wound dressings does not have to be declared by the manufacturers, investigations of contact allergy often remain inconclusive.

Recent reports in the literature,^{2,3} the willingness of the manufacturer to disclose product information, and additional chemical investigations enabled us to confirm lauryl glucoside as a relevant contact allergen in foam dressings. Although the quantified amount of lauryl glucoside is low (1.5 ppm), it might be expected that, with repeated use and under occlusive conditions, especially on damaged skin (ie, leg ulcers), allergic contact dermatitis can be elicited; also, primary sensitization from the dressing cannot be fully excluded.

Alternatively, the patient might be reacting to alkyl glucosides in the foam dressing, and, by cross-reactivity, to the patch test with lauryl glucoside, acting as a “marker” for contact allergy to glucosides.

Glucopon 625, which we specifically report on here, is an aqueous solution of alkyl glucosides (C₁₀–C₁₆); we suspect that it potentially also contains lauryl glucoside (C₁₈) as an impurity, in line with the observation that industrial glucoside samples, similarly to the patch test material of decyl glucoside, apparently also may contain alkyl glucosides with different chain lengths.¹ Glucopon 625 is commercialized by BASF (Ludwigshafen, Germany) for use in the production of polyurethane foams. Such foams are based on the reaction of highly hydrophilic polyether alcohols containing a high level of ethylene oxide with

isocyanates, and water as the chemical blowing agent. The porosity of the final foam is determined by the type and concentration of a surfactant added to the foam formulation. The use of alkyl glucosides, applied as cell stabilizers, results in stable, open-celled foam structures (communication from Dow Chemical, Answer Centre, www.dowacusthelp.com; polyurethane surfactants' role in foam formulations, answer ID 5709 July 20, 2017; last accessed March 23, 2018).

Despite the weak sensitization potential of glucosides, the number of patients who are allergic to them may be increasing, as shown by experience in the United States, where these chemicals have recently been awarded the title “Allergen of the Year 2017”,¹² and awareness of their presence in non-cosmetic products may therefore be important.

Despite the suggestion that IBOA, an allergen that has recently shown to be present in medical devices for diabetic patients,¹³ might also be an impurity and allergen in products containing alkyl glucosides,⁵ we could not show the presence of this acrylate in the glucoside-containing foam dressings, or in the glucoside-containing pet.-based patch test materials. This makes it rather unlikely that IBOA plays a role in contact-allergic reactions resulting from the use of these glucoside-containing wound dressings, and nor does it seem to explain allergic reactions to glucoside patch test materials.

Finally, our observation reinforces the need to label consumer products such as wound dressings, used by many patients, in order to avoid skin problems.

ORCID

Stefan Kerre  <http://orcid.org/0000-0003-0847-7578>

Olivier Aerts  <http://orcid.org/0000-0002-0076-2887>

REFERENCES

1. Gijbels D, Timmermans A, Serrano P, Verreycken E, Goossens A. Allergic contact dermatitis caused by alkyl glucosides. *Contact Dermatitis*. 2014;70(3):175–182.
2. Le Cam MT. Le laurylglucoside: nouvel allergène des pansements modernes. *Annales de Dermatologie et de Vénéréologie*. 2013;140:439–440.
3. Jaque A, DeKoven JG. Polyhexamethylene biguanide and alkyl glucosides: unexpected allergens in an antimicrobial foam dressing. *Contact Dermatitis*. 2017;77(6):421–422.
4. Johansen JD, Aalto-Korte K, Agner T, et al. European Society of Contact Dermatitis guideline for diagnostic patch testing—recommendations on best practice. *Contact Dermatitis*. 2015;73:195–221.
5. Foti C, Romita P, Rigano L, et al. Isobornyl acrylate, an impurity in alkyl glucosides. *Cutan Ocul Toxicol*. 2016;35:115–119.
6. Goossens A, Cleenewerck MB. New wound dressings: classification, tolerance. *Eur J Dermatol*. 2010;20:24–26.
7. Valois A, Waton J, Avenel-Audran M, et al. Dermatology and Allergy group (GAD) of the French Society of Dermatology. Contact sensitization to modern dressings: a multicentre study on 354 patients with chronic leg ulcers. *Contact Dermatitis*. 2015;72:90–96.
8. Renner R, Simon JC, Seikowski K, Treudler R. Contact allergy to modern wound dressings: a persistent but neglected problem. *J Eur Acad Dermatol Venerol*. 2011;25:739–741.
9. Müller S, Kiritsi D. Epidermolysis bullosa simplex complicated by allergic contact dermatitis caused by a hydrocolloid dressing. *Contact Dermatitis*. 2017;76:185–186.
10. Koo FP, Piletta-Zanin P, Politta-Sanchez S, Milingou M, Saurat JH. Allergic contact dermatitis to carboxymethylcellulose in Comfeel hydrocolloid dressing. *Contact Dermatitis*. 2008;58:375–376.

11. Spencer A, Gazzani P, Thompson DA. Acrylate and methacrylate contact allergy and allergic contact disease: a 13-year review. *Contact Dermatitis*. 2016;75:157-164.
12. Sasseville D. Alkyl glucosides: 2017 "Allergen of the Year". *Dermatitis*. 2017;28:296.
13. Herman A, Aerts O, Baeck M, et al. Allergic contact dermatitis caused by isobornyl acrylate in Freestyle® Libre, a newly introduced glucose sensor. *Contact Dermatitis*. 2017;77:367-373.

How to cite this article: Kerre S, Strobbe T, Naessens T, Theunis M, Foubert K, Aerts O. Alkyl glucosides: Newly identified allergens in foam wound dressings. *Contact Dermatitis*. 2018;1-3. <https://doi.org/10.1111/cod.13026>