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Reference:

Kerre Stefan, Strobbe Tine, Naessens Tania, Theunis Mart, Foubert Kenn, Aerts Olivier.- Alkyl glucosides : new ly identified allergens in foam wound dressings
Contact dermatitis - ISSN 0105-1873 - 79:3(2018), p. 191-193
Full text (Publisher's DOI): <https://doi.org/10.1111/COD.13026>
Full text (Publisher's DOI): <https://doi.org/10.1111/cod.13170>
To cite this reference: <https://hdl.handle.net/10067/1530710151162165141>

Alkyl glucosides: newly identified allergens in foam wound dressings.

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Running title: Alkyl glucosides in foam dressings.

Key words: allergic contact dermatitis, case report, CAS 110615-47-9, chemical analysis, decyl glucoside, foam dressing, glucosides, isobornyl acrylate, lauryl glucoside, wounds.

Introduction

Alkyl glucosides are low-risk allergens that are used as non-ionic, soft surfactants in rinse-off and leave-on cosmetics, antiseptics, hair dyes and food (1). Recently, also glucoside-containing foam dressings, used in the treatment of leg ulcers, have 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 110615-47-9) could be confirmed and quantified by chemical analysis.

Case report

A 70-year-old female suffered from an ulcer on her left ankle since six months which she had treated 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, a bacterial colonisation or superinfection was suspected, the dressing was replaced by Kendall™ AMD antimicrobial dressing, containing a topical antiseptic i.e. 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), as well as with the patients' own products, were performed by author S.K. Both types of foam dressing were patch tested 'as is'. IQ Ultra™ patch test chambers (Chemotechnique®, Vellinge, Sweden) were used, fixed with Fixomull® stretch (BSN medical GmbH, Hamburg, Germany) for 2 days, and read, according to ESCD guidelines (4), after 2 and 4 days. The tests resulted in a +? reaction to lauryl glucoside, and a + reaction 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”, a mixture of glucosides with chain lengths from C₁₀ to C₁₆. To further substantiate the relevance of the positive patch test to lauryl glucoside, a C₁₈ molecule, we performed chemical investigations to verify its potential presence in the foam dressing, and in the commercially available patch test materials of lauryl glucoside 3% pet. (from author S.K.) and decyl glucoside 5% pet. (from the Antwerp department). Because one publication suggested that isobornyl acrylate (IBOA) might be an impurity, and 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) and isobornyl acrylate (Loctite) were dried under N₂ and subsequently redissolved in 150 µL of BSTFA + 1% TMCS/pyridine (2/1). The derivatisation reaction was performed at 70 °C during 1 hour. The foam dressing was first cut into pieces, while patch test material was directly stirred with methanol during 1 hour. The solution was filtered and dried under reduced pressure. The residue was derivatised according to the standard. Samples were injected (1 µL) on a Voyager GC-MS with Trace 2000 GC (Thermo Finnigan) and a Alltech Heliflex® AT™-wax capillary column with a length of 60 m, internal diameter of 0.25 mm and film thickness of 0.25µm (Alltech). The carrier gas He was 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 on 200 °C for 10 min. – temperature increase of 3 °C/min till 230 °C – hold on 230 °C for 20 min. The MS was operated in the electron impact mode with ionisation energy of 70 eV. Chromatograms were recorded using Full scan (range: 29 – 1020 amu) every sample was analysed with a split ratio

of 20. All data were recorded and processed using Xcalibur software, version 1.0 (Thermo Fisher).

Semi-quantitative analysis with GC/MS resulted in an amount of 1.5 ppm lauryl glucoside in the foam. Additionally, similar chemical analyses of petrolatum-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, nor in the patch test materials containing lauryl- and decyl glucoside.

Discussion and conclusion

Allergic contact dermatitis from 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, contact-allergic investigations 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 (i.e. leg ulcers), allergic contact dermatitis can be elicited; primary sensitization from the dressing cannot be fully excluded either.

Alternatively, the patient might be reacting to alkyl glucosides contained within 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 about 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, similar 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 high hydrophilic, high ethylene oxide-containing polyether alcohols 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 by Dow Chemical, Answer Centre, www.dowac.custhelp.com, polyurethanes surfactants role in foam formulations, answer ID 5709 07/20/2017; last accessed 23/03/2018).

Despite their weak sensitization potential, the number of patients allergic to glucosides may be on the rise, as evidenced by experience in the US where these chemicals have recently been awarded with the title of ‘Allergen of the Year 2017’ (12), and awareness of their presence in non-cosmetic products may therefore be important.

In spite of the suggestion that IBOA, an allergen 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, nor in the glucoside-containing petrolatum-based patch test materials. This makes it rather unlikely that IBOA plays a role in contact-allergic reactions from these glucoside-containing wound dressings, 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.

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