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High Frequency of Sensitisation to Decyl and Lauryl Glucoside in Routine Patch Testing in the Netherland

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ABSTRACT

Background: Contact allergy to the alkyl glucosides decyl and lauryl glucoside is increasingly recognized.

Objectives: To determine the frequencies of sensitization to decyl glucoside and lauryl glucoside, to assess changes over the study period, to characterize their co-reactivity pattern, to evaluate the clinical relevance of positive reactions and to investigate whether patients with an atopic history had an increased likelihood of sensitization.

Materials and Methods: Retrospective study of routine testing with decyl glucoside 5% pet. and lauryl glucoside 3% pet. in a cohort of 4343 patients patch tested between 1 November 2019 and 5 January 2026.

Results: Positivity rates were 3.5% for decyl and 3.1% for lauryl glucoside; 5.2% of the patients reacted to at least one glucoside. Doubtful reactions (?+) were common (decyl glucoside 2.5%; lauryl glucoside 3.1%). 1.9% of the total cohort had reactions considered certainly or probably clinically relevant. Co-reactivity between decyl and lauryl glucoside occurred in 40%–47% of positive patients, and atopic history was associated with modestly increased odds of positivity.

Conclusions: Contact allergy to alkyl glucosides was frequent in our patch test population. A substantial proportion of doubtful reactions and the virtual absence of strongly positive reactions suggest that the glucoside patch test materials used have irritant properties.

1 | Introduction

Alkyl glucosides (e.g., decyl, lauryl, cetearyl, coco-, arachidyl, glyceryl and caprylyl/capryl glucoside) are plant-derived, non-ionic surfactants and emulsifiers. They are produced by the reaction of glucose with fatty alcohols, which are mainly derived from palm, coconut or rapeseed oil. Owing to their low irritancy potential, favourable ecological profile, renewable sourcing and ready biodegradability, alkyl glucosides are widely used in cosmetic products, particularly in rinse-off formulations [1, 2].

Since the first report in 2003 [3], contact allergy and allergic contact dermatitis caused by alkyl glucosides have been increasingly recognized. Consequently, decyl glucoside 5% in petrolatum was added to the American Contact Dermatitis Society (ACDS) Core Allergen Series in 2013 and to the European Society of Contact Dermatitis baseline series in 2023 [2].

In routine patch testing, positive reactions to decyl glucoside have been reported in up to 2.4% of patients in North America and up to 1.5% in Europe. Lower rates have been described for lauryl glucoside 3% in petrolatum (North America up to 1.6%, Europe up to 1.3%) [2, 4]. However, a high frequency of 5.3% positive reactions to decyl glucoside was recently reported in Denmark in a small cohort of 151 patients [5]. To date, no single-centre studies have evaluated both decyl and lauryl glucoside in

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patch testing in an unselected patient population. In this retrospective study, we present the results of 6 years of routine patch testing with both alkyl glucosides.

The aims of this study were to determine the frequencies of sensitization to decyl glucoside and lauryl glucoside, to assess changes in these frequencies over the study period, to characterize the co-reactivity pattern between the two alkyl glucosides, to evaluate the clinical relevance of positive reactions and to investigate whether patients with atopic dermatitis had an increased likelihood of sensitization.

2 | Materials and Methods

Between 1 November 2019 and 5 January 2026, 4343 patients were patch tested at the Department of Dermato-Allergology and Occupational Dermatology of Amsterdam UMC for suspected contact dermatitis. Patch testing was performed with Van der Bend patch test chambers (Van der Bend, Brielle, the Netherlands), with fixation using Omnifix elastic (Paul Hartmann BV, Nijmegen, The Netherlands). The occlusion time was 48 h, and the results were read on day (D)2 with a second reading on D3 according to ESCD criteria [6]. D7 readings were not routinely performed, but all patients had been instructed on two occasions to contact the department when new reactions were observed after the final reading. Lauryl glucoside 3% pet. and decyl glucoside 5% pet. (brand AllergEAZE, www.smartpracticeeurope.com) were tested in all patients. Informed consent was obtained from all participants.

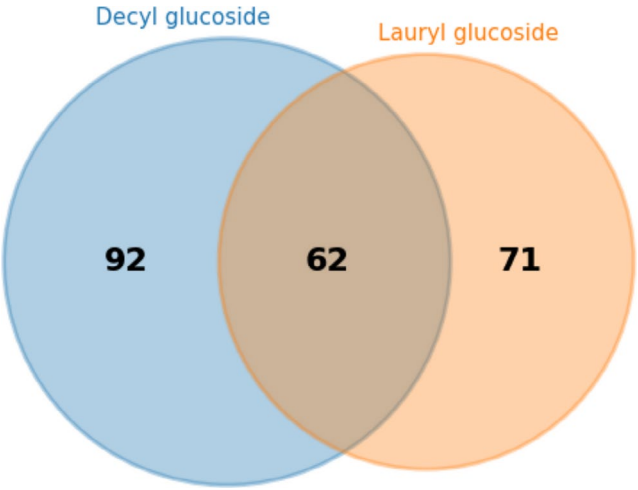


FIGURE 1 | Concomitant reactions to decyl and lauryl glucoside.

3 | Results

The cohort of 4343 patch tested patients consisted of 3057 women (70.4%) and 1286 men (29.6%). Testing with decyl glucoside yielded 154 (3.5%) positive reactions (151 +, 3 ++, 0 +++) and 107 (2.5%) doubtful (?+) reactions; 2 reactions were scored as irritant. Lauryl glucoside yielded 133 (3.1%) positive reactions (132 +, 1 ++, 0 +++), 134 (3.1%) ?+ reactions and two irritant reactions. Of 154 patients positive to decyl glucoside, 62 (40.3%) co-reacted to lauryl glucoside and of 133 lauryl glucoside-allergic patients, 62 (46.6%) also had positive patch tests to decyl glucoside (Figure 1). Thus, 225 patients (5.2%) reacted to at least one of the alkyl glucosides.

Year-by-year positivity rates are shown in Figure 2. Proportions of positive reactions to decyl glucoside ranged from 2.6% to 4.9% and to lauryl glucoside from 2.1% to 3.6%. Rates fluctuated over time without a consistent trend.

Relevance data were available for 124 of 154 (81%) decyl glucoside-positive patients. Relevance was scored as certain in 18 (15%), probable in 34 (27%), possible in 63 (51%) and unlikely/not in 9 (7%). For lauryl glucoside, data were available for 112 of 133 (84%) positive patients. Relevance was scored in 14 patients (13%) as certain, in 38 (34%) as probable, in 53 (47%) as possible and in 7 (6%) as unlikely/not. Overall, 81 patients (1.9% of the total cohort) had reactions that were considered certainly or probably clinically relevant to decyl and/or lauryl glucoside.

Women had significantly lower odds of reacting to lauryl glucoside than men (Odds ratio [OR] 0.61, 95% confidence interval

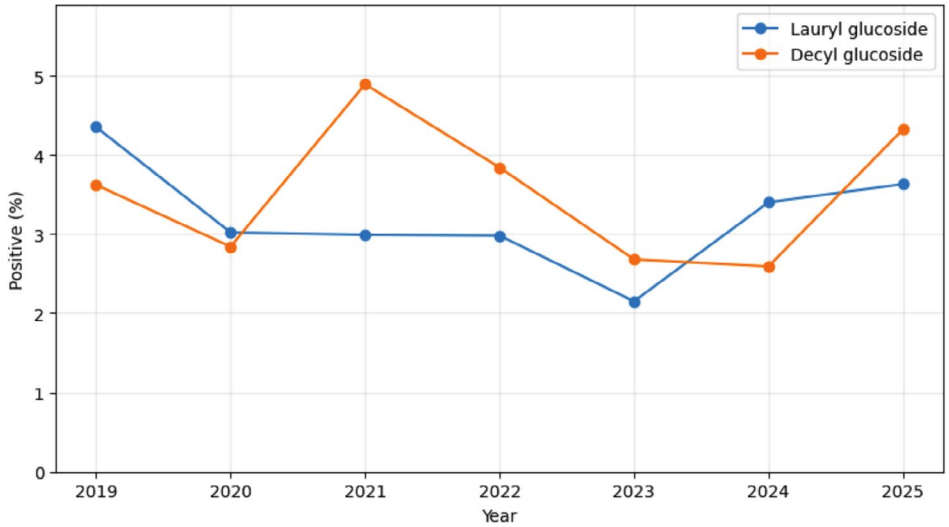


FIGURE 2 | Year-by-year positivity rates for decyl glucoside and lauryl glucoside.

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[CI]: 0.43–0.86) but not to decyl glucoside (OR 0.77, 95% CI: 0.55–1.08). Patients with atopic dermatitis had significantly higher odds of reacting positively to both decyl glucoside (OR 1.90, 95% CI: 1.37–2.63) and lauryl glucoside (OR 2.33, 95% CI: 1.53–3.32). We found no clear association between dermatitis site (face/hand/leg) or age group (0–17 vs. ≥18 years) and positivity to either glucoside.

4 | Discussion

In 6 years of routine testing, positivity rates for decyl glucoside (3.5%) and lauryl glucoside (3.1%) were higher than in most previous reports [2], and doubtful reactions were common (decyl glucoside 2.5%; lauryl glucoside 3.1%). More than 5% of patients reacted to at least one glucoside (decyl, lauryl or both), while 1.9% had reactions considered certainly or probably clinically relevant. Co-reactivity between decyl and lauryl glucoside occurred in 40%–47% of positive patients, and atopic history was associated with modestly increased odds of positivity. These latter two findings have been reported in several previous studies and are discussed in detail in part 2 of a recent review article on contact allergy to alkyl glucosides [7], to which we refer for further information.

It remains unclear why we observed substantially higher frequencies of positive reactions to alkyl glucosides than reported in most previous studies. One possible explanation is that our department functions as a tertiary referral centre, resulting in a more highly selected patient population with an a priori increased likelihood of positive patch test reactions. We also considered the possibility that doubtful (?+) reactions may have been misclassified as positive. However, the considerable number of reactions explicitly recorded as ?+ makes this explanation unlikely. A third hypothesis is that the increasing use of this popular group of cosmetic ingredients [1, 7] in recent years has led to a true rise in sensitization, which is now being detected more frequently. Notably, other recent studies have likewise reported high frequencies of positive reactions to decyl glucoside: 11.2% in a cohort of 241 children aged ≤16 years in Belgium [8] and 5.3% in a population of 151 routinely tested patients in Denmark [5].

However, concerns have been raised regarding the potential irritant properties of the currently available glucoside patch test preparations. Several authors have reported that decyl and lauryl glucoside elicit a substantial number of irritant and/or doubtful reactions [8–10]. In a study from the UK and Ireland, decyl glucoside produced nearly as many irritant reactions as positive allergic reactions [9]. Similarly, Spanish investigators observed that the number of doubtful and irritant reactions to decyl and lauryl glucoside was almost equal to the number of allergic reactions [9], a pattern that is largely consistent with our findings.

In a Belgian paediatric study, in addition to the unexpectedly high rate of 11.2% allergic reactions to decyl glucoside, numerous irritant and doubtful reactions were documented, particularly among atopic children [8]. The authors also noted that both decyl and lauryl glucoside elicited weak (+) reactions in nearly all patients, which is likewise the case in our study. Given the combination of a low reaction index (RI) and a high positivity ratio (PR), these authors expressed concern that some 'positive' reactions might in fact represent false-positive results, that is, irritant reactions mimicking weak allergic responses [8].

Therefore, it appears prudent to interpret morphologically assessed results with caution. 'Positive' reactions to decyl and lauryl glucoside should be carefully evaluated with regard to possible irritant, doubtful, and potentially false-positive (+) responses, particularly in young children [11] with atopic conditions. Complementary diagnostic procedures, such as repeat patch testing, serial dilution testing and repeated open application tests (ROAT), may be required to substantiate the diagnosis of contact allergy [8, 10]. At the same time, it should be emphasized that doubtful (?+) reactions to decyl and lauryl glucoside may, in some cases, indeed represent genuine contact allergy with clear clinical relevance. This is supported by reports of positive patch test reactions to finished products containing the corresponding glucoside that had been applied to the patients' sites of dermatitis [12].

4.1 | Conclusions

Routine testing revealed frequent reactions to decyl glucoside (3.5%), lauryl glucoside (3.1%) or to one or both of these (> 5%). A substantial proportion of doubtful reactions and the virtual absence of strongly positive reactions suggest that the glucoside patch test materials used by us have irritant properties.

4.2 | Limitations

This study has several limitations. First, its retrospective design resulted in some missing data. Second, D7 readings were not routinely performed, and late positive reactions may therefore have been missed. Third, although clinical relevance was assessed using the routinely recorded categories of certain, probable, possible and unlikely/not relevant, the specific culprit products underlying these assessments were not systematically extracted. Consequently, we were unable to analyse which types of products were responsible for clinically relevant sensitization to decyl and lauryl glucoside. In addition, long-term follow-up data were not available. Finally, the study was conducted at a tertiary referral centre, which may have influenced the composition of the patch-tested population and may limit the generalizability of our findings.

Author Contributions

Norbertus A. Ipenburg: conceptualization, investigation, formal analysis, writing – review and editing. **Anton C. de Groot:** writing – original draft. **Thomas Rustemeyer:** supervision, writing – review and editing.

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The authors have nothing to report.

Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Research data are not shared.

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