

**TABLE 1** Patch test reactions to dipropylene glycol and propylene glycol

Patient	Dipropylene glycol [tested concentration(s) reaction strength]	Propylene glycol [tested concentration(s) reaction strength]
Johansen et al. <sup>1</sup>	0.5% pet. + 0.5% aq. +	0.5% aq. –
Presented case	20% pet. ++	30% aq. – 100% –
Clinic patient #1	20% pet. +	30% aq. – 100% +
Clinic patient #2	20% pet. +/-	30% aq. +/- 100% +/-
Clinic patient #3	20% pet. +/-	30% aq. – 100% –
Clinic patient #4	20% pet. +/-	30% aq. – 100% –

Note: Grading of reactions: +/-: doubtful, macular erythema; +: erythema induration; ++ erythema, induration with papules/vesicles.

Abbreviations: aq., aqueous; pet., petrolatum.

625 patients tested to DPG (20% pet.); two also reacted to PG (Table 1).

Patch test concentrations and vehicles for PG and DPG vary.<sup>3,4</sup> Serial dilutions of DPG were not performed in our case. Current belief assumes cross-reactivity between PG and DPG, but more studies are needed to address this important question.

#### CONFLICTS OF INTEREST

None of the authors has any conflict of interest to declare.

#### AUTHOR CONTRIBUTIONS

**Malina Yamashita Peterson:** Conceptualization (equal); formal analysis (equal); investigation (equal); writing – original draft (lead); writing – review and editing (equal). **Joohee Han:** Conceptualization (equal); writing – review and editing (equal). **Erin M. Warshaw:** Conceptualization (equal); formal analysis (equal); investigation (equal); supervision (lead); writing – review and editing (equal).

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# Occupational allergic contact dermatitis caused by tetrahydroxypropyl ethylenediamine in hand disinfectants

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## CASE 1

A 54-year-old man with a history of atopic dermatitis and mild interdigital hand eczema presented with erythematous swelling of the face and neck and aggravation of hand eczema during the coronavirus disease 2019 (COVID-19) pandemic (1½ years). For 20 years he had worked in the same large warehouse for electronics, with no change in his work tasks (mainly computer work and unpacking of goods). He noticed clinical improvement of the rash during summer vacation, and a relapse after only 1 day of work.

Patch testing was done with the European Baseline Series and a locally composed supplementary series. We used Finn Chambers and Scanpor Tape (Epitest Ltd Oy, Tuusula, Finland), applied on the upper back and occluded for 2 days. Readings were performed according to the European Society of Contact Dermatitis' guideline.<sup>1</sup> The only positive reaction was to tetrahydroxypropyl ethylenediamine (THPE) 1% in pet. (+ on days 2, 5, and 6). THPE was contained in the patient's hand sanitizer at work (Plum disinfectant gel) at a concentration of <1% according to the data sheet. Repeated Open Application Test (application of the hand sanitizer two times daily on a 5-cm<sup>2</sup> area of the patient's antecubital fossa) was positive after 3 days (Figure 1). The patient described use of the hand disinfectant 10 to 30 times daily during the pandemic. Both his facial and hand eczema disappeared completely after replacing it.

## CASE 2

A 40-year-old healthcare worker with a history of atopic dermatitis and hand eczema presented with worsening of hand eczema during the COVID-19 pandemic and improvement during periods of work leave. During a workday, she was exposed to wet work and used hand disinfectants up to 200 times. She experienced aggravation related to use of hand disinfectants.



**FIGURE 1** Positive Repeated Open Application Test with the Plum disinfectant gel showing erythema in the cubital fossa after 3 days

Patch testing was performed with the European Baseline Series. Personal products and three available hand disinfectants were tested "as is." Testing was performed like in Case 1. Positive reactions were found to Ceduren ethanol gel (+ on days 3 and 7) and Quick disinfection gel (+ on day 7). Test with the presently used Plum hand disinfection liquid was negative. A recently used Plum hand disinfection gel declared THPE, but was not available for testing. THPE is an ingredient in the other two hand disinfectants used (Ceduren and Quick) according to the products labels. In one of the products, THPE is named by its synonym ethylenedinitrillotetrapropan-2-ol. Patch testing with THPE showed a dose-response reaction; follicular reaction to THPE 0.01%, and a positive reaction to 0.1% (+ on day 3) and 1% (+ on day 3; Figure 2).

In conclusion, the patient had occupational allergic contact dermatitis to THPE contained in several hand disinfection products used in the workplace. The eczema improved after cessation of use of THPE-containing disinfectants.

## DISCUSSION

Both patients presented here were allergic to THPE in hand disinfection gels. THPE is used as a neutralizer to achieve the gel-like



**FIGURE 2** Patch test result at day 3 showing a dose-response reaction to increasing concentrations of tetrahydroxypropyl ethylenediamine, follicular reaction to 0.01%, and a + reaction to 0.1% and 1%

consistency. Only a few cases of THPE allergy have previously been reported, but most of them related to exposure to cosmetics and sunscreens.<sup>2</sup> Antelmi et al.<sup>3</sup> reported a case of occupational allergic contact dermatitis, also to Plum disinfection gel. In this case, the patient used a gel from an old batch, because batches produced after 2016 have been THPE free in Sweden. In Denmark, however, THPE is still included in the gel, but according to the producer, they are considering replacing it with another neutralizing agent.

Both our patients had onset of symptoms during the COVID-19 pandemic. During this period the use of hand sanitizers exploded, potentially resulting in THPE allergy becoming more frequent. However, because many centres do not test with THPE by default, allergic contact dermatitis due to hand disinfectants could have been overlooked and the symptoms misinterpreted as irritant contact dermatitis. Allergic contact dermatitis due to hand disinfectants should be considered not only with hand eczema, but also in case of facial rashes, as touching of the face probably occurs unconsciously several times daily.

Our cases illustrate the importance of considering THPE allergy if patch testing is negative, but clinical suspicion is maintained. Clinicians should be aware of this allergen in patients with eczema of the hands, face, and neck, who are in contact with cosmetics, sunscreen, or disinfectants. In our two hospitals in Denmark we have recently added THPE (1% in pet. prepared in-house) to our supplementary baseline series.

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# In vivo evaluation of allergic contact dermatitis to nylon suture: A case report

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Allergic contact dermatitis is commonly associated with superficial dermatologic exam findings. However, a T-cell-mediated hypersensitivity reaction may also occur with antigen penetration into deeper skin layers, carrying additional clinical implications. This phenomenon is observed in allergic contact dermatitis to surgical sutures, which may present with poor wound healing due to granulomatous inflammation.<sup>1</sup> Contact dermatitis to nylon is believed to be rare relative to other suture materials.

#### CASE REPORT

A 61-year-old woman was evaluated in the allergy clinic for suspected contact dermatitis at a surgical incision site. Five years prior, she underwent surgical ganglion cyst removal that was complicated by delayed-onset, pruritic dermatitis around the incision and poor wound healing. Physical exam at the time did not suggest wound infection or